

Marine Corps Warfighting Laboratory

Project Metropolis



To improve Naval expeditionary warfighting capabilities across the spectrum of conflict for current and future operating forces.

Military Operations on Urbanized Terrain (MOUT)

Battalion Level Experiments

Experiment After Action Report

February 2001



UNITED STATES MARINE CORPS
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REPORT – THE COMBINED ARMS TEAM IN MOUT

Encl: (1) Project Metropolis Battalion Level Experiments After Action Report

1. This report gathers, organizes and synthesizes information from live, force-on-force experiments conducted by the Marine Corps Warfighting Laboratory. These experiments occurred during the period 22 January through 9 February 2001 at the former George AFB in Victorville, CA—now called Southern California Logistics Airport (SCLA).
2. Experiments began with training and limited technical assessments (LTAs) from 22 January through 2 February. High intensity combat experiments occurred from 5 through 9 February. Prior to experimentation, Marines from the 3rd Battalion, 4th Marines, First Marine Division, were put through two weeks of urban warfare training using the Basic Urban Skills Training (BUST) package developed by MCWL.
3. The BUST package used in the pre-experiment training, including recommended Individual Training Standards (ITS,) has been fully coordinated with—and is currently being reviewed by—CG, MCCDC (Training Command).
4. The tactics, techniques and procedures (TTPs) from BUST that proved successful in the experiments are included in the MOUT section of the recently released Coordinating Draft (CD) of MCWP 3-11.2 Marine Rifle Squad. The Laboratory staff is also in the process of carefully reviewing all Marine Corps doctrinal publications to identify any areas in our reports—principally the X-Files—that need to be more closely integrated into the efforts of MCCDC Doctrine Division (WDID).
5. We will continue to search for better ways to fight and win more effectively and efficiently in the urban battlespace. However, we know from our experiments that the quickest and best way to improve our urban warfighting skills is through focused MOUT training and use of combined arms in a maneuver approach to urban combat.


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Executive Summary

Background. The Marine Corps Warfighting Laboratory (MCWL) conducted the battalion (rein) phase of *Project Metropolis* (ProMet) during the period 22 January through 9 February 2001 at the former George AFB in Victorville, CA—now called Southern California Logistics Airport (SCLA). Experiments began with training and limited technical assessments (LTAs) from 22 January through 2 February. High intensity combat experiments occurred from 5 through 9 February. Prior to experimentation, Marines from the 3rd Battalion, 4th Marines, First Marine Division, were put through two weeks of urban warfare training using the Basic Urban Skills Training (BUST) package developed by MCWL.

Coordination with MCCDC Training and Doctrine Proponents. The BUST instruction package, with attendant draft Individual Training Standards (ITS), is currently under review in the Marine Corps Training Command. Also, all BUST tactics, techniques and procedures (TTPs) are included in the MOUT section of the Coordinating Draft (CD) of MCWP 3-11.2 Marine Rifle Squad. MCCDC Doctrine Division has distributed this for review and comment.

Evaluation of Previously Trained Forces. Concurrent with the battalion training, some previously trained forces in 3rd Bn 4th Marines who had completed the BUST program last November were put through practical application testing to determine the degree to which they retained their proficiency. Following this, they participated in LTAs and experiments with technologies from both MCWL and other agencies such as ONR and DARPA. Separate reports have been filed by the agencies conducting experimentation with technologies during the period

Scope of this Report. This report is principally focused on the battalion experimentation week, with the exception of a short review of *Land Warrior*. However, a summary of *all* urban combat casualty information is included in Section VII.

Task Organization of Experiment Forces. All experiments were conducted using various types of combined arms task forces. In addition to the infantry, these included tanks, light armored vehicles, assault amphibious vehicles, combat engineers, combat service support teams, and rotary wing aviation.

Experiment Observer / Controllers (O/Cs). A nucleus team of military and support contractor personnel from MCWL form the permanent staff of *Project Metropolis*. Subject matter experts (SMEs) supplement this nucleus group during various phases of training and experiments. In addition to the British Royal Marines officer and the Australian Army officer who are permanent members of the MCWL staff, other SMEs include Marines, sister services and allied military men from around the world. These personnel help to collect data and maintain the flow of the experiments while providing perspective-expanding ideas during the daily planning and debriefing sessions. Here is a summary list of the sources of O/Cs for these experiments. An expanded list is included Section I (Overview).

- MCWL, MCCDC and MARCORSYSCOM
- US Navy (Medical)
- US Army (Armor, Infantry and Medical)
- The United Kingdom (Royal Marines and Army)
- Canada (Infantry and Engineers)
- Australia (Land Warfare, Combined Arms Directorates; Defence Science & Technology)
- Israel (Military Attaché, TRADOC Rep and Engineer School)

- Sweden (Army HQ, Armored Brigade)
- Norway (Infantry)
- Netherlands (Royal Marines)
- France (Infantry HQ Staff)
- Hungary (Army Staff)
- Belgium (Infantry Training School)

Facilities. The ProMet team negotiated access to SCLA in Victorville CA. This facility includes more than one thousand (1000) housing units in various states of repair. Because its infrastructure has degraded markedly since the base closure, it now reasonably replicates conditions that exist in many of the projected employment areas for the MAGTF. It has added a significant degree of realism to experimentation.

Experiment Design. Every experiment was free-play, force-on-force against a competent OPFOR using Chechen-style tactics. Actual hits on Marines' bodies by Simunitions (colored waxy rounds fired from M-16s) and MILES 2000 scorekeeping gave us high confidence in the casualty data. This was supplemented by O/C subjective assessments. All BLUFOR units had an O/C with them at all times. Each battalion and OPFOR maneuver element down to squad level and each tank, AAV, etc. also had an O/C.

Experiment Focus Areas. Our experimental areas of focus were:

- Tactics (including techniques and procedures)
- Tactical command and control (situation awareness)
- Training
- Combat service support
- Casualty collection treatment and evacuation
- Rotary wing operations
- Land Warrior (*Limited Technical Assessment*)

Effect of Experimental Tactics on Mission Accomplishment and Casualty Rates. We experimented with three tactics based on the tenets of *maneuver warfare*. The goal was to move from a linear, attritionist approach to one of maneuver. These three experimental tactics are: *Urban Penetration*, *Urban Thrust* and *Urban Swarm* (patrolling). Our analysis showed that when executed by properly trained units, each of these conceptual tactics accomplished the mission with less than historically demonstrated casualty rates. Beyond this, our results show that a properly trained combined arms force using these tactics can conduct successful offensive urban operations with a force ratio of 3-to-1, vice the more commonly held belief that urban success needs force ratios of 5- or 10-to-1.

Casualty Information. The addition of Simunitions has given us a better idea of what part of the body sustains hits in the urban battle. Most hits occur in the upper torso—head, right shoulder and arms. This is the part of the body that is most often exposed when they are popping corners or firing around and/or over cover.

- A major data point discovered is that rounds hit a significant number of rifles.
- In most cases, it renders these weapons unserviceable.
 - These weapons will need repair or replacement.
 - We need to plan for this.

Uniform. Additional protection from blast and glass is needed. We had Marines wear gloves (leather with nomex Outers), balaclavas for head and neck protection, and sand / wind goggles

with the ballistic lens for eye protection. We should consider providing nomex balaclavas and a nomex type uniform—or coverall for standard utilities—for planned urban combat operations. This uniform might also provide some protection against the effects of *thermobaric* weapons.

Situation Awareness (SA). Our experiments showed us that the battalion command element could maintain sufficient SA in an urban environment to enable the commander to conduct maneuver warfare operations. The battalion staff reported that they consistently maintained approximately 50% accuracy on the location and disposition of *friendly* forces. Achieving success with 50% SA points to the potential for greater effectiveness if we can increase this percentage. The battalion put scout/sniper teams into the city prior to commencing operations. Having these teams reporting on the enemy and taking occasional shots greatly enabled the battalions operations. Although this points to the positive impact of advance use of scout/snipers, we have to note that their early insertion during our experiments was artificially easy due to the absence of any noncombatant population.

Gap in Tactical Communications. We saw a gap in tactical communications between platoon commander and squad leader. At present we have no secure way—other than face-to-face contact—to pass orders, receive reports, etc., between the platoon commander and the squad leader. When the platoon commander and squad leader chose to use the Intra Squad Radio (ISR) to bridge this gap—a function for which it is not designed—it resulted in simulated operational security (OPSEC) breaches. We also saw that when the ISR was used for this purpose, it often made the frequency unusable between the squad leader and his fire teams. This lack of adequate tactical radios also resulted in not having a way for the seconds in command (e.g., XO and platoon sergeants) to maintain situation awareness to enable quick and decisive assumption of command or to request / clear fires quickly in the urban battlespace.

Training Time. We found that units up to company size took about *three to four weeks* of training to achieve individual, team and unit combined arms proficiency. We saw the battalion beginning to show proficiency towards the end of the third week's experiment phase. The battalion commander and his staff, as well as the company commanders, all agreed that a BLT would require approximately 4-5 weeks to achieve a reasonable level of proficiency. Using the MCWL BUST Essential Skills Test (BEST) with its accompanying practical application phase, we saw that urban warfighting skills had already deteriorated in a previously trained company even though only 60 days had passed since their last urban training. However, once they were refreshed, their mission effectiveness increased and their casualty rate dropped quickly. Section III documents the results of the BEST Summary Assessment.

SNCO and NCO Tactical Training. We continued to see evidence that until receiving BUST, the majority of our NCOs and SNCOs do not seem to have the highly developed tactical skills to do their jobs in the urban battlespace. This highlights the MCWL contention that it is a less than optimum approach to expect NCOs in the ground combat MOSs to gain their tactical knowledge of MOUT through OJT.

Combined Arms Training. We continue to see *units* that have had little or no training with combined arms assets. In all cases, we had to drill units in such basic skills as tactical debarkation from AAVs, working with tanks and LAVs, etc. Over 90% of the Marines involved in ProMet experiments state that they have *never* conducted operations with a tank prior to their involvement with Project Metropolis.

Combat Service Support Teams. We experimented with the Combat Support Team (CST) concept in hopes of reducing the requirement for GCE units to conduct their own resupply and casualty evacuation. We applied a concept that uses BUST trained teams from the FSSG to bring supplies to units at any point within the tactical formation and to evacuate casualties. We saw this as a considerable force multiplier.

Casualty Evacuation (CASEVAC). Our previous experiments showed that casualty evacuation in the urban battlespace normally takes much longer than one hour, so we experimented to find ways to extend the “golden hour” for casualties without seriously jeopardizing their chance for survival. We disproved one approach while finding that another showed significant promise. Specifically, having the surgeons forward did not appreciably improve survival but forward deployment of *shock/trauma* teams appeared to do so.

R/W MOUT Operations. We saw that properly flown RW aircraft can be effective—and survive—in the low-rise urban battlespace. We found that using a 6-line CAS brief reduced response time. We also saw that under our limited circumstances, CAS requests could be effectively coordinated and cleared-to-fire at the company level.

Technology Enablers.

- *Small, Low Profile Vehicle* (we experimented with the John Deere “Gator”) is extremely useful at the company level for resupply and CASEVAC.
- *Intra Squad Radio (ISR)* enhances mission effectiveness.
 - Must be used with brevity codes to reduce its vulnerability to intercept.
 - Must not be used above the platoon level.
 - Needs better headset.
- *Tactical Medical Casualty Support (TacMedCS)* system enhances medical performance.
- *Fire Team Cognitive Skills Trainer* is a good training aid.
- *MILES 2000* significantly improves training in the urban environment.
 - Would be more effective if it could be integrated with aviation assets.
- *Shoot-Through-the-Wall System* has great potential to enhance urban training environment.

Land Warrior. We saw that the *Land Warrior* system has the potential to greatly enable maneuver at all levels while reducing or eliminating fratricide. Although it is not ready for fielding to the Operating Forces, it has the potential to significantly influence or alter many of the techniques and procedures that we currently use in MOUT.

Summary. In this last event in the series of Project Metropolis experiments in Block III urban warfare, we once again saw it clearly demonstrated that properly trained combined arms teams can fight and win in the urban battlespace, while reducing friendly casualties below the traditional 30% per day. Keys to this success are training, and use of combined arms.



Section I Overview

Background. The battalion (rein) phase of Project Metropolis (ProMet) was conducted during the period 22 January 2001 and 9 February 2001 at the former George AFB—now named Southern California Logistics Airport (SCLA) in Victorville, CA. Our effort entailed training, limited technical assessments and experiments. The first two weeks were devoted primarily to training the battalion in basic urban skills using the Basic Urban Skills Training (BUST) package. This package, complete with draft Individual Training Standards (ITS) was forwarded in December of 2000 to Training Command for vetting preliminary to Corps-wide distribution. Its content has been developed during more than three years of experiments. The basis for our recommendations for frequency of training—skill sustainment—documented through the BUST Essential Skills Test (BEST) with its accompanying practical application phase. Also, all BUST tactics, techniques and procedures (TTPs) are included in the MOUT section of the Coordinating Draft (CD) of MCWP 3-11.2 Marine Rifle Squad. MCCDC Doctrine Division has distributed this throughout the Marine Corps for review and comment.

Chronology. Concurrent with the battalion training, I/3/4 and supporting attachments (tanks, AAVs, LAVs, engineers, and CSST) that completed the BUST program last November, were evaluated through practical application testing (e.g., the tarpaper shooting house, etc.) to ascertain how well they had retained their urban fighting proficiency. We found that many of these skills had degraded significantly after only 60 days. Following this evaluation—which also provided refresher training—they participated in some Limited Technical Assessments (LTAs) and experimentation with various technologies from both the MCWL, the Marine Corps System Command and other agencies such as DARPA, ONR and the Center for Emerging Threat Opportunities (CETO).

The battalion and all supporting units conducted urban experimentation during the period 5 through 9 February 2001.

This report only covers the battalion experimentation week, with the exception of a short review of a US Army R&D program, *Land Warrior*. Separate reports have been filed by the agencies that conducted experiments with technologies during the period 22 January through 2 February.

Experiment Observer / Controllers (O/Cs). A nucleus team of military and support contractor personnel from MCWL comprise the permanent staff of *Project Metropolis*. Subject matter experts (SMEs) supplement this nucleus group during various phases of training and experiments. In addition to the British Royal Marine and Australian Army officers who are permanent members of the MCWL staff, other SMEs include Marines, sister services and allied military men from around the world. These personnel help to collect data and maintain the flow of the experiments while providing perspective-expanding ideas during the daily planning and debriefing sessions. Here is a list of the sources of O/Cs for these experiments.

- MCWL Liaison Officers (LNOs) to the US Army Combat Development Activities: e.g.,
 - Armor Center at Ft. Knox
 - Artillery Center at Ft. Sill
- Marine Corps Combat Development Command representatives; e.g.,
 - The Basic School (MOUT Doctrine Proponent)
 - Australian LNO
 - Canadian LNO
- MARCORSYSCOM

- Nonlethal Weapons Directorate
- C4I Directorate
- U.S. Navy
 - Naval Aerospace Medical Research Lab
- US Army
 - Armor Center at Fort Knox, KY
 - Infantry School at Ft. Benning, GA
 - Medical Command, Ft Sam Houston, TX
- The United Kingdom
 - Staff representatives from the Royal Marine Corps
 - Staff representatives from the British Army Fighting in Built Up Areas (FIBUA) Training Center
- Canada
 - Staff representatives from the Canadian Infantry Center
 - Staff representatives from the Combat Engineer Regiment
- Australia
 - Future Land Warfare Directorate, Army Headquarters
 - Combined Arms Training and Development Centre
 - Defence Science and Technology Organisation
- Israel
 - Military Attaché
 - Israeli Representative to US Army TRADOC
 - Company Commander from Israeli Engineer School
- Sweden
 - Senior Staff Office, Army HQ
 - Commander of the Swedish Armored Brigade
- Norway.
 - Army Infantry School,
- Netherlands
 - Representative from Royal Marine Corps
- France
 - Infantry HQ Staff
- Hungary
 - Army Staff representative
- Belgium
 - Infantry Training School

Experiment Venue. As far as we know, 3rd Battalion, 4th Marines is the first infantry battalion in the Marine Corps—and possibly the U.S. Army—to undergo training in a complex urban environment where the size of the facility permitted employment of the entire BLT. Urban training conducted at Camp Pendleton or Camp Lejeune MOUT facilities is limited to one company of the battalion due to the size of the training sites. However, because of the size and complexity of the nearly 300 abandoned buildings and 1000 housing units in George, it is possible to maneuver a BLT-size unit against a credible OPFOR within its low-rise confines.

Focus. The primary focus of the week was to examine various tactics in the urban environment. Building on the knowledge gained in the previous phases of ProMet, we directed our primary effort at examining the viability of conducting *maneuver warfare* tactics in the urban battlespace.

All of these experiments were conducted using various types of combined arms task forces. In addition to the infantry, these included tanks, light armored vehicles, assault amphibious vehicles, combat engineers and rotary wing aviation. Combat Service Support Teams (developed during previous experiments) were used to support the ground combat element.

Methodology. Every experiment involved free-play, force-on-force methodology against a competent OPFOR formed by L/3/4. Actual hits on Marines' bodies by Simunitions (colored waxy rounds fired from M-16s) and MILES 2000 alerts gave us high confidence in casualty data.

The OPFOR for this experiment used asymmetrical tactics, patterned after Chechens versus the Russians. Each OPFOR element consisted of a five-man team of two riflemen, one automatic rifleman, and two AT-4s (to simulate RPGs).

Observer/Controllers (O/Cs) accompanied each battalion and OPFOR maneuver element down to squad level. Each tank, AAV, etc. also had an O/C.

Experimentation: Under the broad heading of *tactical development*, these were areas of focus:

- Tactics (including techniques and procedures)
- Command and control
- Training
- Combat service support
- Casualty collection treatment and evacuation
- Rotary wing operations in MOUT
- Land Warrior (Limited Technical Assessment)

Detailed summaries of each day's experimentation, including graphical map overlays, are included later in the body of this report. Here is an explanation of each of the areas of focus.

Tactics. During the course of the experiment, we examined the following three tactics, Urban Penetration, Urban Thrust and Urban Swarm (patrolling).

1. **Urban Penetration.** This tactical concept envisions a force (in this case a reinforced battalion) entering the urban battlespace from a safe haven, such as amphibious shipping, to an objective within the city, seizing and controlling the objective or patrolling within the city. The area between the "safe haven" and the objective is only controlled during passage of the force through or over the area.
 - 1.1. Of the several movement formations we experimented with, the one that showed the most promise was the Diamond. This formation, composed of two infantry companies, a tank platoon, AAV platoon, combined antiarmor team (CAAT), and a battalion Tactical CP, was able to effectively maneuver through enemy controlled territory with the tactical flexibility to respond decisively to enemy action at any point on the Diamond.
 - 1.2. The battalion task organization featured a tank and AAV section that were attached to each infantry company, as were 81MM mortars. CAAT was held as the battalion reserve. One company was assigned the point (relative to the direction of movement) and one flank of the Diamond. The second company was assigned the rear and other flank of the diamond. A tank and two AAVs were placed at the pinnacle of each point on the diamond. This formation provided for direct supporting fire at each critical point of the formation and also enabled rapid maneuver and response by one element of the formation to support another in case of engagement with the enemy. In addition to providing 360-degree security, the Diamond formation also enabled interior lines of communication and better control of movement.

- 1.2.1. A variation on the Diamond concept is the “floating Cross” which is task organized in much the same way, but enables the battalion to extend portions of the formation to a greater degree than the Diamond.
- 1.3. We had planned to conduct a penetration using helicopterborne air assault, but had to cancel because of poor weather. The primary issues to be examined during the air assault were to be Urban SEAD, and insertion of the ground force into multiple zones on multiple axes.
2. **Urban Thrust.** This tactical concept envisions a tactical formation maneuvering from a safe haven to an objective within the city. As the ground corridor is opened, units are deployed along the route to maintain a line of communication from the safe haven to the objective.
 - 2.1. For this experiment, one company was tasked to penetrate and hold the flanks of the corridor. Once this was accomplished, the second company passed through the corridor and conducted an attack on the objective. Had the forces been available, multiple companies (or battalions) could be used to open and extend the corridor.
 - 2.2. This tactic proved to be the best in facilitating resupply and casualty evacuation. However, holding the corridor open for extended periods of time may be difficult and certainly gives the enemy a fixed objective upon which to focus. Nevertheless, units holding the corridor do have the advantages of the defender.
3. **Urban Swarm.** Although no specific experimentation was conducted with the Swarm tactic, limited patrolling was conducted using infantry/armor teams. The patrols consisted of an infantry squad reinforced with a tank. This tactic met with moderate success and has potential if the infantry and tank have experience working with one another. Once again, the lack of combined arms training inhibited early-on operations.

Tactical Command and Control / Situation Awareness. The fundamental issue addressed with C² was to find out if the battalion command element could maintain sufficient situation awareness in an urban environment to enable the commander to conduct operations in a maneuver warfare context. Based upon our observations and debriefs of the battalion commander and his staff, the answer is yes.

1. The battalion staff was consistently able to maintain approximately 50% accuracy on the location and disposition of *friendly* forces. Although this may appear to be limited, in the urban battle it may well be as good as it gets pending the fielding of effective position location and reporting systems (such as that contained in Land Warrior).
2. However, the battalion’s knowledge of the enemy was well less than 50%, probably in the 10-20% range. One notable element of maintaining SA on an asymmetrical enemy was the fleeting nature of the enemy disposition. Contacts called in by units were only valid for several minutes, as the enemy was using hit-and-run tactics.
 - 2.1. Often times the S-2 situation map would show these enemy locations for an hour or more providing a false picture of the real situation.
3. The battalion was successful on several occasions in getting scout/sniper teams into the city prior to commencing operations. Having these teams reporting on the enemy and taking occasional shots greatly enabled the battalions operations.
 - 3.1. This once again speaks to the imperative of developing an urban ground reconnaissance capability (a project underway in the lab). A serious limitation to our experiments with the capability to insert and operate scout/snipers is that: 1) there were no civilians in the city; and, 2) the inserts were of very limited duration, several hours at most. A great deal of further work must be done in this area to achieve a viable operational capability.

Training. During the course of the experiment we attempted to determine the length of time necessary to train a battalion combined arms team to be proficient in urban combat. This included the requisite individual, team and unit skills, as well as the training necessary to conduct combined arms operations, and the requisite training for the battalion commander and his staff to conduct urban operations.

1. As stated in previous reports, we found that units up to company size took about *three to four weeks* of training to achieve individual, team, unit and combined arms proficiency. This trend held consistent for this experiment, with the battalion only beginning to show proficiency towards the end of the experimental phase, which was the third week.
2. The battalion commander and his staff, as well as the company commanders were queried during the AAR regarding this issue, and all agreed that a BLT would require approximately 4-5 weeks to achieve a reasonable level of proficiency. (Compare this with the average two weeks that most battalions now conduct).
3. We also evaluated the previously trained company (I/3/4 trained in November) with a series of urban skills tests upon their arrival at George. With only 60 days since their last urban training, skills had already deteriorated, and squads were averaging 60-70% casualties in the shooting house during the first run through.
 - 3.1. Once they were refreshed, the casualty rate dropped quickly.
 - 3.2. This reaffirms our previous findings for the need for refresher training on a regular basis to maintain proficiency. This approach is similar to the ACE's required pilot combat readiness percentage (CRP) training.

Combat Service Support. We continued to develop and evaluate the Combat Support Team (CST) concept. This concept utilizes BUST trained teams of personnel from the FSSG to bring supplies to units at any point within the tactical formation and evacuate casualties.

1. This reduces the requirement for GCE units to conduct their own resupply and casualty evacuation.
2. We saw this as a considerable force multiplier—actually, a multiplier of the force savings—as each wounded Marine normally uses two to four personnel for his evacuation. This takes much needed infantry “off the line” when the battalion conducts its own CASEVAC.
3. During this phase of ProMet, the CST experimented with a GS concept in support of the battalion and a DS concept to each of the infantry companies.
4. Both concepts worked well and can be utilized depending on the situation.
 - 4.1. The GS concept, which we used for the first time during this experiment, had the CST commander co-located with the battalion S-4 and a CST liaison with each company gunny.
 - 4.2. Resupply and CASEVAC requests were forwarded from the platoon sergeants to the company gunnys then to the CST at the battalion S-4 position.
 - 4.3. The S-4 coordinated with the S-3 to determine priorities when required, and set the conditions for the CST commander.
 - 4.4. The S-4 was also responsible for maintaining the current tactical situation (in coordination with the S-3) for the CST commander and advising him of the best routes to units and the security situation.
5. Detachments (Dets) of four or five CSS personnel used the ATV Gator—and to a lesser extent the HMMWV—to carry prepackaged supplies forward and remove casualties from the battlespace.
 - 5.1. They delivered supplies to the squad level, while they retrieved casualties from company casualty collection points (CCPs).
 - 5.2. Total size of the CST was approximately 25 personnel.

Medical/CASEVAC. Our previous experiments clearly showed us that casualty evacuation in the urban battlespace almost always takes more than one hour. Because this can significantly affect the survival rate of wounded Marines, we searched for ways to lengthen the “golden hour” that determines the fate of a casualty. During the experiment, we tried two ways to extend the “golden hour” for casualties in order to lengthen the time available for successful CASEVAC without seriously jeopardizing the casualty’s chance for survival. And, so we did not seriously reduce the warfighting capability of the infantry unit, we made them responsible only for getting casualties from the point of wounding to the collection point. Although this could sound like a lack of concern for casualties, it is clear that if enough able-bodied Marines stop fighting to tend to casualties, *everybody* will become a casualty. This reinforces the concept that CST conducts casualty evacuation from the CCPs to the Battalion Aid Station (BAS) in the rear.

In order to extend the time available for CASEVAC, we looked at two possible options. One was to have the battalion surgeons forward (with corpsman support) at the company collection points. The second was to have “shock/trauma” teams at the collection points.

1. Having the surgeons forward did not add appreciably to the capability to extend the “golden hour” as the surgeons were very limited in what they could accomplish without a surgical suite and a suitable facility to operate in. Certainly they could accomplish more than the corpsmen, but could not fully use their capabilities.
2. The notional “shock/trauma” teams appeared to be a better solution. These teams would be composed of personnel who had a higher level of training than the average corpsman but less than a surgeon (EMT or IDC level).
 - 2.1. We recommend that this concept be further examined for utility, not only in the urban environment, but all battlespace environments.

We also saw the need for better, or more frequent, individual first aid or “buddy aid” training for all personnel. The isolated and compartmented nature of the urban battlespace makes immediate treatment of casualties by the platoon corpsmen very difficult, often with lengthy delays. Better training of the individual Marine could provide the necessary lifesaving treatment required during the critical first 15 minutes following wounding.

Rotary Wing Operations in MOUT. These were the first ProMet experiments that we have used ACE R/W aircraft. We used a significant amount of R/W CAS—primarily AH-1W Cobras, with some UH-1N Hueys. We conducted limited CASEVAC. Unusually poor weather in the mountain passes between Camp Pendleton and *Desolate City* caused us to cancel our planned helicopterborne company level penetration experiment. During all ACE experiments, aircraft faced live simulations of both a radar controlled AAA gun system and a man portable air defense system (MANPADS). This enabled us to evaluate some R/W ordnance delivery tactics and very limited troop lift survivability flight paths. We were unable to simulate the threat from small arms and automatic weapons.

Experimental Approaches for Use of Aviation. Because the OPFOR used Chechen style hit-and-run tactics, CAS targets only presented themselves for brief periods. Therefore, we addressed ways to reduce response time in our experiments. We used two experimental approaches to speed up the CAS process

Company Level Coordination of CAS. Our first experimental approach assessed the company commander’s capability to rapidly coordinate CAS requests and clear the aircraft to fire. To do this, the battalion commander delegated this authority to the company commanders. The key to effective use of this authority is the company commander’s ability to maintain acceptable

situation awareness within his operating area to enable him to coordinate and deconflict fires. Our experiment scenario was eased somewhat because there were no adjacent units from other organizations in the area. We found that the company commander was often too involved with fighting his company to coordinate and deconflict CAS for his smaller units. However, we saw that the company XO was able to do this very effectively.

6-Line CAS Brief. Our second approach involved the use of a 6-line CAS brief vice the standard 9-line CAS brief to speed the processing of air support. We based this on the statement in the MAWTS-1 ACE MOUT Manual that states: “*An abbreviated CAS brief may be more suitable for rotary wing aircraft.*” The six-line brief proved to be very effective and was lauded by both pilots and FO/FACs. The six-line brief is as follows:

A/C callsign_____This is_____ -Fire Mission Over
My Position Marked By_____ -Friendly Loc_____
Direction_____ - Enemy Loc_____
Distance_____
Target Description_____
Target Marked By_____

Urban SEAD. We also reviewed the issue of Urban SEAD. Specifically, what is the best way to execute the TTPs in the MAWTS ACE MOUT Manual and the doctrine found in JP 3-01.4 that tell us that SEAD for CAS comes principally from the GCE. We conducted considerable discussion of the issue during one of the Braintrust sessions.

During our discussion of Urban SEAD, we looked at the issue of providing protection for landing helos in a restrictive ROE environment, where we are concerned for noncombatant casualties and collateral damage. Our proposed concept to deal with the issue was to insert reconnaissance or scout/sniper teams into the vicinity of selected LZs and give them these two missions:

- Establish “eyes-on” the area to determine if the proposed insertions had a chance for success.
- Once the mission was underway, engage enemy who attempted to interfere with the insert.

We postulated that the teams would engage enemy manpads, automatic weapons, etc., that emerged from buildings to engage the aircraft. Our goal was to see if the surprise of the initial insertion using multiple axes, coupled with the SEAD provided by the scout/sniper teams would allow us to get at least two waves successfully into multiple LZs. Units inserted in these waves would have as a primary mission of extending the SEAD coverage in order to enable the arrival of subsequent helos. Unfortunately, we were unable to experiment with this concept due to the cancellation of the air assault because of poor en route weather. The Lab will be pursuing this concept as part of the Urban Ground Reconnaissance effort (developing the capability within the Reconnaissance Battalions), and the Urban Rotary Wing working group.

Rotary Wing Effectiveness. Based on our limited flight data, we saw that properly flown RW aircraft can be effective—and survive—in the low-rise urban battlespace. Cobras consistently provided effective support to heavily engaged ground units and survived.

Land Warrior. We conducted a limited technical assessment of the Army Land Warrior system during the experiment. The U.S. Army PM for Land Warrior provided 15 Land Warrior Systems for this purpose. The Army also provided the funding to conduct the training (by civilian contractors), for the use of the equipment, and the cost for experimentation. (Total cost in excess of \$500K).

The *Land Warrior* system has undergone a metamorphosis in the past year. Under the new PM, they have reduced the size and complexity of the system and improved the effectiveness. The system contains the following major features:

- A dual computer/radio subsystem (the radio is voice over IP).
- A small one by two inch heads up display that attaches to the helmet and provides the Marine with the location on a map of all personnel in the squad.
- A GPS position locator with inertial navigation that provides constant automatic update of the Marine's location to all others in the squad.
- An M-4 rifle with integrated daylight camera (viewable through a HUD), a thermal weapon sight and a close combat optic.
- Enhanced power system.
- Improved body armor.

The *Land Warrior* system has the potential to greatly enable maneuver at all levels while reducing or eliminating fratricide. It is not ready for fielding to the Operating Forces; however, it has made giant strides in the right direction. The GPS/position locator system alone brings a new dimension to the infantry. The system enables the squad leader and/or platoon commander to continuously track the location of his men on the battlespace. This, as compared to the roughly 50% SA the battalion commander experienced. We observed the Land Warrior squad leader maneuvering his squad at much greater distances and depth than his unequipped counterparts. The land warrior squad was also able to conduct multiple simultaneous entries into buildings with reduced risk of fratricide.

With the integrated day TV sight, Marines were also able to shoot around corners, scan rooms prior to entry, etc. The system has the potential to revolutionize many of the techniques and procedures that we currently use in MOUT.

We recommend that the Marine Corps closely monitor the development of Land Warrior, and support the Army effort. Current Army planning is to begin fielding of the system in 2004.

Other Observations. The following general observations were made during the course of this and the previous Project Metropolis experiments.

NCO Tactical Training. We continue to see evidence that the majority of our NCOs and SNCOs do not seem to have the requisite tactical skills to do their jobs. They are in short, not receiving the proper tactical training. We invest six months of dedicated training for all lieutenants, followed by specialized training in their specific MOS. NCOs by contrast, receive six weeks at best, and much of the training is not tactical. In this highly lethal urban environment, SNCOs and NCOs often find themselves in command of the platoon in very short order. Even if this were not the case, leaving NCOs to gain their tactical knowledge primarily through OJT is a disservice to the NCO and is giving us a less than satisfactory NCO corps.

Combined Arms Training. As stated in previous reports, we continue to see units that have had little or no training with combined arms assets. In all cases, we have had to drill units in such basic skills as tactical debarkation from AAVs, working with tanks and LAVs, etc. Over 90% of the Marines we have worked with have *never* conducted operations with a tank prior to their engagement with Project Metropolis. This problem is one that we must get a handle on if we are to effectively employ CA teams in the urban or any other battlespace.

Platoon to Squad Radio. The Marine Corps currently has the SINCGARS system fielded to the platoon commander level. It also has the ICOM fielded to the squad and fire team leaders. Thus, we have a system that runs from the MAGTF and/or Division commander, to the platoon commander—with a break between the platoon commanders and the squad leaders—then a system that runs from the squad leader to the fire team leaders. This presents a complete tactical disconnect between the platoon commander and the squad leader. We also have no tactical voice communication for the second(s) in command; i.e., the company XO and the platoon sergeants of the various companies and platoons. At present, we have no way, other than face-to-face contact to pass orders, receive reports, etc., from the platoon commander to the squad leader, and no way for the seconds in command to maintain situation awareness, to take quick and decisive command in the event of the incapacitation of the commander or to request/clear fires quickly in a dispersed and segmented battlespace.

Summary. This is the last event in the series of Project Metropolis experiments to examine and develop the TTPs for *block three* (high intensity) urban operations. We once again clearly demonstrated that properly trained combined arms teams can fight and win on the urban battlespace, while reducing friendly casualties below the traditional 30% per day.

Keys to this success are two primary elements, training, and combined arms. As stated previously, we estimate that it takes 5 weeks for a BLT to achieve basic proficiency, and that proficiency can only be maintained through repeated and periodic sustainment training. This training must include aviation, tanks, AAVs, combat engineers, CST and infantry working together to develop the necessary skills and confidence in one another.



Section II Training

Of the factors in the capability development/DOTES system, *training* offered the greatest potential to rapidly improve the performance of Marines in MOUT. In fact, application of TTPs learned from the Basic Urban Skills Training (BUST) package has proved to be the key to improved mission performance by the Operating Forces assigned to participate in MCWL's Project Metropolis (ProMet) urban combat experiments.

The BUST package is a refinement of classes developed by the ProMet staff in concert with subject matter experts (SMEs) from HQMC, MCCDC, allies (most notably, the British) and the Operating Forces. This comprehensive combined arms curriculum incorporates things learned during more than three years of experiments conducted with I MEF and II MEF forces. It also incorporates appropriate extracts from detailed research with US and foreign forces.

BUST consists of ten full training days that build incrementally from individual training, through fire team, squad and platoon level—to a culminating company practical application. Because BUST is modular, the package can be run as a stand-alone program or it can be integrated into existing training packages. For example, its modular parts can be included as a MOUT component within existing training curriculums at Marine Corps schools such as The Basic School or the School of Infantry.

The outline schedule for BUST package is enclosed with this report. All of the BUST material was delivered to Training Command in December 00. Here is a summary:

- Day 1. Introduction to the urban environment and to the characteristics of threat forces.
Movement in the urban environment.
- Day 2. Assaulting and forcible entry.
- Day 3. Observation and reporting, navigation, clearing and go firm.
- Day 4. Introduction to counter sniper operations and patrolling.
- Day 5. Day and night patrolling in the urban environment.
- Day 6. Organic infantry weapons systems in MOUT and offensive / defensive planning.
- Day 7. Introduction to mechanized and armor assets and operations in MOUT.
- Day 8. Day and night platoon attacks.
- Day 9. Platoon combined arms attacks.
- Day 10. Company combined arms attacks.
- Leadership Day, conducted as concurrent training, focused on:
 - Commanders estimate of the battlespace.
 - Patrol planning and coordination.
 - Aviation support in the urban environment.
 - Combat engineers in the urban environment.
 - Fire support planning in the urban environment.
 - Combat service support.
 - Sniper employment.
 - Urban Wargame.

Training Methodology. More than 850 Marines from I MEF have been trained according to the BUST curriculum during both the Company and Battalion Combined Arms experiments. We conducted this training aboard the former George Air Force Base (called *Desolate City* for experiment purposes) in Victorville, CA.

Desolate City was divided into three separate BUST sites, each with its own Chief Instructor and instructor cadre formed with qualified Marines from 1st MARDIV MOUT Instructors Course, 2nd MARDIV, and MCWL ProMet staff. Dividing the training population into three groups and assigning them to discrete, nearly identical sites within the training area optimized class size. Each group got exactly the same training, using lectures, flip charts, guided demonstrations and computer-aided graphics. Each of the classes was followed by practical application exercises for the individual Marine, fire team, squad, platoon, and company.

Individual Classes. The BUST training provides every Marine the opportunity to learn the necessary individual skills to survive within the urban environment. Every Marine in the experiment force, regardless of rank or MOS, attended the classes. This proved to be extremely effective. While class content was *refresher* material for some, it was essential *initial* material for most—especially those not in a Combat Arms MOS. Our goal was to provide a common body of knowledge to every participant in the experiment.

Leadership Classes. Squad leaders and above got these classes. The subject matter ranged from Estimate of the Urban Battlespace to Fire Support within the Urban Area. These are designed to be “extra tools for the kit bag” for the leadership.

Battalion Staff Classes / Wargame. The Battalion staff participated in three wargames that were designed to stimulate their thoughts about the application of maneuver warfare in MOUT.

Battalion Self- Training. During the battalion BUST, we used instructors from the battalion to train themselves. These instructors were billet holders in key areas in the battalion and taught straight from the lesson plans in our BUST curriculum. The classes taught by the Battalion were:

- Intro to the Urban Environment (S-2).
- Intro to the Urban Threat (S-2).
- Chechnya PME (S-2).
- Urban Observation and Reporting (Battalion Gunner).
- Urban Navigation (Battalion Gunner).
- Machine Guns in the Urban Environment (Battalion Gunner).
- Anti Armor in the Urban Environment (Battalion Gunner).
- Mortars in the Urban Environment (Battalion Gunner).
- Counter Sniper (Scout/Sniper Platoon Sergeant)
- Intro to the M1A1 (Tank Platoon Commander).
- Intro to the AAV (AAV Platoon Commander).
- Aviation Support in the Urban Environment (Battalion FAC).
- Fire Support Planning in the Urban Environment (S-3).
- Sniper Employment in the Urban Environment (Scout/Sniper Platoon Sergeant).
- Combat Service Support in the Urban Environment (S-4).

The class material was provided to the battalion several weeks before it deployed to *Desolate City*. The battalion instructors commented that the information in the classes was very comprehensive and easy to use. Several of the instructors were able to relate pertinent examples from their real world experience into the classes, thereby making them more informative and while creating a more personalized period of instruction.

Lessons Learned

Use Combat Camera Footage from History.

- Inserting attention-gaining film footage from movies such as “Full Metal Jacket” and “Saving Private Ryan” can enhance classes.
 - However, we need to look for actual combat cameraman film footage from past conflicts.

Create a Combined Arms Trainer Model Board for Urban CAS.

- This model board would be a three dimensional replication of *Desolate City* with a section of Yodaville added into the model.
- Battalions could use such a model to train their Fire Support Teams (FST) in requesting, coordinating and controlling fire support—including CAS—in the urban environment.

Use Practical Application(s) to Reinforce Learning. The practical application sessions allowed Marines to work on their individual, fire team, squad, platoon and company techniques taught during lectures and demonstrations. Instructors guide and critique every event to ensure the Marines only reinforce positive learning.

- These exercises give Marines the opportunity to break glass, breach doors, move through sewers, make a second story building assault, patrol a TAOR, attack objectives, react to snipers, work out SOPs with armor /mechanized units, navigate, communicate via ISR, and fight in a rubble environment.
- Marines who use Simunitions during an attack inside the tarpaper shooting-house discover very rapidly that these rounds penetrate through the flimsy walls. In addition to providing a live simulation of ball ammunition coming through walls, when the rounds hit human beings, they hurt.
 - This causes Marines to react realistically to an inside-the-building situation that almost certainly will occur in urban combat.
- All of these practical application exercises enable the Marines to apply and develop what they learn in BUST *before* beginning the experiment.

Add More Practical Application (PA) Exercises to BUST. We will add tactical driving and combined arms breaching exercises to the course. The first PA will enhance the abilities of individual vehicles and crews to operate within this new environment. We will address tactical movement across corners, micro terrain and obstacles. The combined arms breach will give Marines the opportunity to execute a breaching and reinforce the learning points: suppress-observe-secure-reduce (SOSR) that they have been taught.

Use Phased Approach to Unit Patrols and Attacks. During the second week of training, we have the units begin to work together as platoons and companies. This training progresses incrementally from the easiest to the most difficult. The first phase begins with dismounted *squad* patrols and attacks, without any armor or mechanized attachments. The second phase adds the armor and mechanized assets to the squad. The third phase is *platoon* attacks and patrols with armor/mech forces. The final phase of the course is to do *company* combined arms patrols and attacks. This progressive training plan effectively phases in learning about the increasingly difficult challenges of the urban battle.

Implement Feedback/Recommendations from Training Population

- More Training Days for Company Operations.
 - Marines told us that they want and need more opportunity to conduct these patrols and attacks.

- They recommend that the company BUST be extended to twelve days allowing maximum time to work urban patrolling and attacks.
- These extra two days will enable the company to enhance its capability by allowing it to work out specialized SOPs for patrols, attacks, breaching, and defense.
- More Training Days for Battalion Operations.
 - During the Battalion Training, even with the size of Desolate City, it was difficult to train two companies.
 - This extension would allow each company the fullest opportunity to maximize training with armor/mech units as well as adjust its own SOPs.



Section III BUST Essential Skills Testing (BEST)

Introduction. To assist in understanding requirements for sustainment training following the initial training, ProMet conducts BUST essential skills testing (BEST) to determine:

- How long basic urban combat skills are retained.
- Which of the basic urban combat skills are degraded.
- What is the proper interval for sustainment training

BEST Evaluations. ProMet has conducted two BEST evaluations, one for platoon level training and one for the company level training. In both cases, the units attended 10 days of BUST followed by 9 days of urban experimentation. The experiments included debriefs and critiques which gave them additional training opportunities. This equates to 4 weeks of progressive individual and collective training.

BEST #1.

- Conducted BUST at Camp Pendleton, CA MOUT site.
- Conducted 9 additional days of MOUT experimentation (proficiency training) at Ft ORD developing TTPs under ProMet instructors and staff supervision.
- Conducted BEST after 52-day gap.
 - The Battalion (1/5) conducted a non-MCWL MOUT FEX at SCLA in the interim.

BEST #2

- Conducted BUST at SCLA.
- Conducted 9 additional days MOUT experimentation (at SCLA) w/associated critiques and debriefs to develop TTPs under ProMet staff/instructor supervision.
- Conducted BEST at SCLA after 65-day gap, with no MOUT operations in between

Results. The findings from both BEST assessments were similar. For example, of 31 similar tasks, the participants in BEST #2:

- Performed 2 higher than BEST #1 (one was a "rarely" up from a "never").
- Performed 12 the same as BEST #1 (2 well and 10 poorly).
- Performed 17 tasks lower than BEST #1
- 6 tasks went from a higher to "some"
- 7 tasks went from "some" or higher to "rarely" or "never"
- 4 tasks went from poor to poorer

Conclusions. Based on these two evaluations, we believe the following conclusions can be drawn. These are provided as:

- TTPs that Marines grasp easily and continue to do well with little sustainment.
- TTPs that Marines do not grasp easily and will require more frequent sustainment training.

TTPs That Marines Grasp Easily and Continue to Do Well with Infrequent Training.

- Maintaining spherical security
- Moving by bounds
- Using overwatch
- Navigating in the urban area
- Conducting hasty clears
- Reaction to sniper
 - Staying with mission intent

- Bypassing or isolating a sniper
- Using available assets to provide covering fire
- Reporting sniper to higher (at squad level)
- Forcible entry
 - Using proper door entry techniques
- Assaulting
 - Designating entry point and route before assaulting
 - Employing covering fires
- Clearing
 - Maintaining "guns and eyeballs"
 - Using "wall, body, weapon" correctly
- Overall
 - Using key terrain

TTPs That Marines Do Not Grasp Easily and Will Require More Frequent Sustainment Training.

- Forcible entry
 - Entering windows
 - Using entry tools properly
- Assaulting
 - Using multiple entry points
 - Marking entry points
 - Checking entry point for booby traps
 - Employing hand grenades in stairwells
- Clearing
 - Designating casualty collection points
 - Clearing objectives systematically
 - Marking cleared rooms and forward progress
 - Checking for booby traps
 - Reporting booby traps to squad leader and others in element
 - Marking booby traps
- Consolidation
 - Handling casualties properly
 - Reporting casualties to higher
- Overall
 - Coordinating with higher HQ
 - Passing info to Platoon commander (enemy, casualties, location, sit rep, etc.)

Summary. Our detailed post-training and experimentation analysis clearly indicates that individual, team and unit proficiency improved significantly. However, from a mission effectiveness perspective, this improvement was only demonstrated after two weeks of MOUT training under the command of their unit leadership—platoon through battalion. In other words, BUST personal and unit skills training has to be amplified and implemented through unit cohesion and SOPs.



Section IV Assessment of Battalion Staff Use of BUST Materials

For the first time in the ProMet series of experiments, battalion personnel taught more than half of the BUST classes to their unit.

Adequacy of Lesson Plans . The majority of instructors stated the BUST instructor packages provided adequate to excellent lesson guides and presentation materials. Although most stated that the lesson guides and presentation aids did not need modifying, some modified them to meet their individual preferences and added more examples they felt relevant. The Battalion Gunner tended to use the material as provided, where the Battalion S-2 and Scout/Sniper Platoon Sergeant modified theirs.

Evaluation of Instruction. All instructors are not created equal, but all except one of the battalion instructors received a preponderance of excellent to outstanding ratings from the training population. The one exception had to be assisted by the Battalion Gunner who stepped in and added enough material to make the instruction effective.

Conclusion. Our data indicates that the BUST material used by the battalion instructors was adequate for use by units training under ProMet supervision. Future evaluation will determine what is necessary for infantry battalions and other MEF elements to implement the full BUST package. This will include establishing a MOUT instructor course with each MEF.



Section V Combined Antiarmor Team (CAAT)

The organic Combined Arms Antiarmor Team (CAAT) from the infantry battalion Weapons Company proved to be an invaluable asset to the company and battalion combined arms team in MOUT. Their speed and firepower was second only to the tank, and their mobility greatly enhanced their capability to support-by-fire the targets designated by the dismounted infantry.

General. CAATs were organized differently for the company and battalion experiments. However, we found that the best mix for security of individual teams was with four vehicles working together as heavy guns (.50 cal and Mk-19) and TOWs. The battalion task organized their CAAT and cross-attached them to tanks and/or infantry to provide flank, forward, or rear security in support of the overall mission.

- While they were effective screening forward of the FLOT, they created problems for tank and infantry elements in the lead that were trying to deconflict their frontal arcs of fire.
- This caused devastating hesitation amongst the maneuvering force, causing casualties.
- CAAT should not be allowed to screen forward in a heavy threat environment.

Missions. CAAT was successful in completing most missions assigned. These missions included:

- Quick Reaction Force (QRF)
- Convoy security
- Flank security
- Rear security
- Check point control
- Patrolling to emplace snipers.
- Patrolling to retrieve snipers (deception).
- Casualty evacuation.

CAAT was not used in Quartering Party during link up. We recommend that they do this.

QRF. CAAT completed this mission with great maneuverability and speed. Their speed allowed them to move in and out of the battalion security bubble to provide security when and where needed. When employing CAAT in this role, it is crucial that the CAAT teams understand the situation and have a total understanding of the routes to and from the target area they are entering. Good urban navigation is absolutely critical when conducting this mission. And, driver appreciation of effective cover and concealment opportunities becomes essential in this tight urban environment. Drivers must get time practicing this kind of MOUT movement.

Convoy Security. CAAT was able to complete this mission with a degree of success similar to that performed while acting as the QRF. Their speed allowed them to move rapidly with the convoy to conduct resupply and mass casualty drills. Again, good urban navigation is critical during this type of mission. CAAT must not move past the FLOT and enter high threat environments. Situation awareness is a must!

Flank Security. CAAT's ability to accomplish this mission was superb. However, the coordination of fires between the flank screen and the main body is absolutely critical to reduce the potential for fratricide. These small teams used on the flanks of the battalion maneuver unit caused the enemy to react and put him in a dilemma; i.e., focus on the battalion or the flank screen? This allowed the unit to maneuver and destroy the enemy because they could not react in time.

Emplacing Snipers. CAAT should **not** be used in a high threat environment to rapidly emplace scout/snipers and then withdraw them. While their speed and firepower are great assets, their lack of armor and breaching capability severely hinders their ability to accomplish this mission.

Techniques. Urban battlespace environmental considerations caused CAAT to modify their TTPs. For example, although they used techniques like bounding and overwatch, the distances the unit bounded were significantly reduced. This technique, integrated with infantry support, proved to be extremely effective against an asymmetric enemy, and caused the enemy to remain off balance.

The CAAT dismounted their TOWs but left their thermals up, added AT-4 and SMAW capability, and added a SAW to a vehicle to provide additional security. This proved to be extremely effective. While they gave up the capability to fire TOW missiles, they gained the benefit of having a mobile thermal imager on the flanks that could fix the enemy positions with both the M2 and Mk19 machine guns at longer ranges. They can use shoulder fired AT weapons for the close fight.

The use of security/dismount teams on the vehicles became critical during flank security force missions because of the compartmentalization of the urban battlespace. During all of these missions, situation awareness and navigation are an absolute must. The teams need to understand what and where actions are being taken.

Capabilities. The CAAT teams brought several advantages to the fight for the infantry company and battalion. Their speed, agility, and firepower benefited the forces on numerous occasions. Their ability to maneuver between houses and in alleyways was extremely effective when supported by infantry. Their thermals were a combat multiplier to squad and fire team leaders during intensive fights at that level.

Vulnerability. The CAAT teams, while they were successful, lacked the armor to protect themselves when left without security. The only time CAAT was destroyed in the urban environment was when they were separated from the larger force without security or overwatch.



Section VI Participant Comments

Tactical Situation Awareness (Command and Control).

- Battalion maintained SA by listening to the company's two ISR nets.
- Battalion needs a firepower-intensive reaction force.
- CAS was pushed to the platoons, with the company clearing the missions.
- Battalion HQ needs to support the companies, and not get sucked into their individual fights.
- AAV-C7 may not be best platform for urban SA and C².
- Every Marine should have a map.
- Inform everyone if higher changes orders because a PFC may end up platoon commander.
- Battalion needs to go firm occasionally to pass enemy situation and current BLUFOR locations.
- Provide Combat Engineers their own ISR frequency.
- Tanks and Tracks need good communications with their security teams.
- Company HQ needs to divide responsibilities:
- CO fights the battle,
- XO handle reporting to battalion and receiving orders from.
- Platoon commander needs a good understanding of Commander's Intent in this terrain.
- Pushing information up keeps higher off your back.
- ISR needs pre-program channel capability to allow easier switching between nets.
- Need to keep assistant squad leader's SA up so if he needs to take over, he is ready.
- CAAT in general support of battalion led to its being employed more efficiently.
- Engineer platoons should not be attached to infantry companies. It takes away from their flexibility and ability to respond to engineer missions in other areas.

Movement.

- Using AAVs to support foot-mobile infantry is not working; need to allow AAV to use its speed.
- AAVs need to keep moving. They are too big a target to sit in one place for more than 30 minutes.
- Give AAV rear crewman a SAW or 240G to increase vehicle security.
- LAVs need to keep moving.
- Battalion XO believes units lost momentum due to a lack of SA when leaving the AAVs. Need to provide a camera feed to embarked troops for their SA on events outside the vehicle.
- Company had tendency to move too quickly and leave a large gap between the two forward platoons.
- Squads need to remember not to bunch-up during bounding.
- Platoon commanders need a net so they can talk directly to scout/sniper elements in their AOR.
- Combat Engineers need to have access to fast transportation assets to allow them to clear avenues of approach quickly.
- Accountability for Marines is still essential.
- Platoon commanders sometimes lost SA on squad locations because squads were moving so fast that reporting did not keep up.
- Having platoons support each other by fire and choosing "key terrain" to hold along the corridor worked well in the *Thrust* experiment.

Combat.

- Saw same problems with squad leaders we saw in *Urban Warrior* with platoon commanders—lack of combined-arms/maneuver warfare training and experience.
- OPFOR commander stated he feared the ability of CAAT (mobility, firepower, relative stealth) the most;
- Addition of dismounted infantry would make CAAT more successful.
- Thrust works as a good concept for a limited objective mechanized raid.
- M1A1 tanks and their security teams tended to fight different battles during the experiment.
- Track security teams require at least six Marines.
- Dismounted scouts are critical to CAAT success; if they had them in the experiment, they were undermanned. Need battle drills for CAAT and scouts.
- BLUFOR tended to have Blue-on-Blue engagements when Marine positions were not coordinated with vehicles.
- Many Blue-on-Blue engagements caused by adjacent units, tanks, CAAT.
- NVGs/Thermals are a must for night defense.
- Not everyone moving in your area is OPFOR.
- Direct fire assets work best in close urban fight.
- Deconfliction with adjacent units—BLUFOR SA—is key, especially at night.
- Enemy moves too fast for QRF to be effective.
- Need faster way to clear fires across unit boundaries with OPFOR in sight.
- Need a lightweight rocket (lighter than AT-4). Light enough so that infantry can carry many of them to use to destroy snipers and machine guns in buildings.
- In platoon operations, think of the tank as another squad with a lot of firepower, don't hesitate to use it.
- After contact with the enemy, don't leave the tank detachment behind while in pursuit.
- Need better CASEVAC procedures and execution.
- When we did not lead building entry with grenades, we took significantly more casualties.
- Breaking contact drills are essential when performing a tactical extract.
- Patrolling
- An infantry squad with a tank (with good coordination) worked extremely well together as a patrol unit.
- Tank/infantry patrol unit working in conjunction with scout/snipers and infantry OPs was very effective.
- At night, need to use more observation posts and less patrolling.
- Areas assigned to platoons were too large to patrol and secure patrol base (two buildings of four apartments).
- Direct platoon communications with scout/sniper teams in their patrol sectors was great tactic. Platoon knew which buildings to clear and which they could bypass.

Reconnaissance and Surveillance.

- CAAT and STA worked well together, was a force multiplier. CAAT provided:
 - “Pouncer” for scout/sniper observation posts (using fire support, more infantry)
 - Move STA teams around
 - Provide extract/CASEVAC support for scout/sniper teams.
- The “Pointer” UAV provided good collection on OPFOR obstacles. Needs a north-seeking arrow in video display.
- Battalion S-2 believed Pointer needs too many people to operate for the Company to use; it needs to be a battalion asset.

Combat Service Support.

- More security is required for CSS and medical elements moving within Battalion AOR.
- Logistic trains need crew-served weapons to enhance their security.
- Gator/HMMWV refuelers worked well.
- Gator vehicle needs better tires and larger engine.
- Gators can quickly run out of room in CASEVAC missions.
- Need to develop field radio replacement capability
 - (resupply pool and new crypto control procedures).
- Evacuation of damaged radios requires tracking to control crypto.
- Move KIA/WIA out of sight to keep OPFOR from creating ambush opportunities.

CSTs:

- Smaller refuel transport capability is good
- Need to push medical capability down to Companies to stabilize patients
- Need to determine resupply demand for urban operations
- Need Tactical Urban Rescue Team capability.
- AAVs are not the best vehicles to perform CASEVACs.

Training.

- Need more first aid *buddy aid* training.
- Need full actions on obstacles rehearsals with tanks, engineers and infantry before doing it.
- Need more tank/squad patrol work.
- Need more mechanized movement with security techniques work.
- All platoon commanders should learn the 6-line CAS brief.
- We received all the training we needed, but did not have enough time to do Practical Application.

Miscellaneous.

- MOUT is battle drill intensive.
- If we create an Urban CAX, need to add EW and HUMINT capabilities.



Section VII Experiment Casualty Summary Assessment

This assessment relates to all ProMet experiments—platoon, company, and battalion events. Where appropriate, we include information from the earlier MCWL experiments entitled *Urban Warrior (UW)*. The casualty figures are extracted from MILES-generated recordings, actual body hits by Simunitions, and subjective judgments made by our highly experienced O/Cs.

High Ratio of Fatalities to Wounded. The number of killed-in-action (KIA) versus wounded-in-action (WIA) probably is higher than it would be in real combat. In all events, O/Cs tended to kill anyone in a vehicle that was hit by an RPG or in a room where a grenade exploded. This is consistent with what we found to be the widely held view that a shot "at" someone with one of these weapons always results in killing them. Further, there may have been a tendency to kill combatants rather than to force a unit to deal with casualty handling requirements. This is a function of Marines wanting to stay involved in winning the fight—and certainly would not have happened in actual combat.

Superior Force Ratios Resulted in Fewer Casualties. Although certainly not a surprise, BLUFOR casualty rates tended to drop as the force ratio increased in their favor. The combined casualty rates for both UW and ProMet tended to be lower in events where the combat ratio was *at least* 3 BLUFOR to 1 OPFOR.

Better TTPs Reduce Casualties. Data also shows that average casualty rates during ProMet events were lower than UW rates at the same force ratios. WE think this is a result of the improved TTPs and level of training between ProMet events and UW events.

Casualty Rates Are Slightly Higher in Events When a Vehicle Carrying Personnel is Hit.

Casualty rates are higher in events that include at least one instance where an AAV or LAV was destroyed with more than just the crew inside. As shown in table VII-1, vehicle personnel casualties do not account for a large percentage of the total casualties for events.

Table VII-1 Relationship of Vehicle Mounted Casualties to Total Casualties		
Battalion Event #	Overall Casualties	Casualties in Vehicles
1	22%	4%
2	22%	7%
3	33%	11%
4	23%	8%

The Majority of Casualties Occur in The Open.

Our information continues to confirm that all forces (friendly and opposition) take the majority of their casualties in the open. See tables VII-2 and –3.

Table VII-3 Casualties Related to Activities		
Activity	No. Casualties	% of Total Casualties
Moving in the Open	96	37%
Assaulting	28	11%
Entering Building	22	8%
Clearing Building	21	8%
Exiting Building	6	2%
Other	91	34%
Total	264	100%

Table VII-2 Where Casualties Occur		
Location	No. Casualties	% of Total Casualties
In room	66	25%
Outside	117	44%
Roof top	10	4%
Vehicle	71	27%
Total	264	100%

Direct-fire Small Arms Account for the Greatest Number of Casualties. As shown in table VII-4, our data continues to indicate that direct fire weapon systems account for the majority of the casualties.

Fratricide. Fratricide accounted for approximately 9% of casualties in all events. Fratricide percentages improved from the platoon level events to company/battalion events. There was no significant increase in fratricides at night during any event. Table VII-5 summarizes our fratricide information for all ProMet experiments.

Table VII-5 Casualties Related to Fratricide			
Experiment	Total Casualties	Total Fratricides	Casualty %
Platoon Level	125	18	14.40%
Company Level	142	10	7%
Battalion Level	356	31	8.70%
Total	623	59	9%

Table VII-4 Casualties Related to Weapon		
Weapon	No. Casualties	% of Casualties
AT4	43	15%
Grenade	40	14%
Simunitions	93	33%
MILES	88	31%
Booby Trap	2	1%
Machine Gun	7	3%
Mine	7	3%
Total	280	100%

Table VII-6 Fratricides Related to Weapon	
Weapon	No. Fratricides
Vehicle .50 cal	10
CAS Fire	3
Grenades	7
M1A1 gun	2
Small arms	19
Total	41

Marines Continue to Kill or Wound Themselves With Their Own Grenades. In almost every event, Marines became casualties from their own grenades. This is usually during building clearing, especially when they are attempting to move up a stairwell. As shown in table VII-6, six (6) of the 31 fratricides (19%) in the latest (battalion) experiment were from grenades.

Armor, Mechanized and CAAT Fratricides Decreased as SA and Coordination Increased. In both the company and battalion level experiments, the fratricides caused by armor, CAAT or mechanized assets occurred during the initial events. As elements became more accustomed to working together, coordination and SA improved, and these types of fratricides stopped.

RPGs (MILES 2000 AT4 simulators) Accounted for Almost 60% of Vehicle Casualties. ProMet used the new MILES 2000 AT4 simulators during the company and battalion level experiments. The casualty rates might be greater, but we experienced some problems with systems operation. In almost all cases the vehicles were stopped when hit. Table VII-7 summarizes this information.

Table VII-7 Vehicle Casualties Related to Weapon		
Weapon	No. Vehicle Hits	% of Total Hits
RPG (AT4)	26	59%
AT mine	6	14%
LAV 25mm	4	9%
Vehicle .50 cal	3	7%
Booby trap	1	2%
Grenade	3	7%
Small arms	1	2%
Total	44	100%

Stopped Vehicles Are Casualty Producers. Stopped vehicles had a much higher casualty rate than moving vehicles during company and battalion level experiments. We measured the casualty percentage of stopped vehicles at 71% while the casualty rate for moving vehicles was 29%. Beyond the basic physics that tell us that it is harder to hit a moving target than a stationary one, we saw it demonstrated over and over that it is *much* more difficult to engage a moving

target in the compartmented urban battlespace. This is because segmented lines of sight only present fleeting opportunities to effectively engage moving vehicles. However, our data indicates that many of the stopped vehicle casualties occurred because the drivers did not "tuck-up" near a building, but stopped in the open, thereby giving the enemy an unobstructed long-range shot. Table VII-8 summarizes this information.

Table VII-8 Vehicle Casualties Related to Movement		
Vehicle	Moving	Stationary
M1A1	1	2
LAV	0	9
AAV	3	9
HMMWV	6	8
Gator	2	1
Total	12	29

The Small Urban Vehicle (Gator) was the Most Survivable Routinely Employed Vehicle in the Battlespace.

All vehicles in the playbox were equipped with MILES. The "total in box" number represents the total number of times a single vehicle entered the playbox and was available to be engaged by OPFOR.

Table VII-9 Vehicle Kills					
Vehicles	Total in Box	Total Mob Kill	Total Cat Kill	Total Casualties	Percent Casualties
M1A1	66	7	0	7	11%
M88	4	0	0	0	0%
LAV	59	3	11	14	24%
AAV	95	3	11	14	15%
HMMWV	103	10	9	19	18%
GATOR	70	1	3	4	6%
LVS	1	0	0	0	0%

The Urban Thrust Tactic Tended to Reduce Casualties While Accomplishing the Mission.

Casualties tend to be lower when BLUFOR uses Urban Thrust tactic. During *Urban Warrior* we saw that *Thrust* events had AVERAGE casualty percentages of 38% versus 48% average for all events. During the ProMet battalion level *Thrust* event, the casualty percentage was 22%.

Although this was the same casualty ratio experienced for different tactics used in the other two events, the force ratio was only 4.66 to 1 compared to 7.85 and 5.03 to 1. This may indicate a certain economy of force can be gained using this tactic.

ProMet Experiment Personnel Casualty Data. The following tables summarize all casualty information from the ProMet experiments and relate it to the force ratios.

Table VII-10 - Platoon Combined Arms Level - Ft Ord, CA Feb 2000								
Event	BLUFOR			OPFOR			Force ratio	Remarks
	Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties		
1	67	2	3%	19	4	21%	3.53	Patrol with LAVs
2	64	5	8%	19	5	26%	3.37	Single axis with tanks
3	69	11	16%	17	10	59%	4.06	Day/night penetration with tanks
4	67	16	24%	18	11	61%	3.72	Penetration with tanks and AAV
5	70	15	21%	21	5	24%	3.33	Day/night penetration w/ tanks and LAV
6	86	29	34%	16	9	56%	5.38	Day attack of fixed pos w/ tanks, LAVs, AAV
7	84	8	10%	13	7	54%	6.46	Penetration with tanks, LAV, AAV
Totals	507	86	17%	123	51	41%	4.12	

Table VII-11 - Platoon Combined Arms Level - SCLA May 2000							
BLUFOR			OPFOR				
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
85	21	25%	20	7	35%	4.25	Patrol
89	18	20%	20	5	25%	4.45	Patrol
87	5	6%	20	7	35%	4.35	Attack
91	29	32%	20	6	30%	4.55	Penetration and attack
84	12	14%	20	9	45%	4.20	Penetration and attack
88	14	16%	27	13	48%	3.26	Penetration and attack (resurrected some)
87	30	34%	20	16	80%	4.35	Penetration and attack of defended position
611	129	21%	147	63	43%	4.16	

Table VII-12 - Company Combined Arms Level - SCLA Nov 2000							
BLUFOR			OPFOR				
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
202	30	15%	43	15	35%	4.70	Patrol, one platoon leads-two follow in parallel
222	12	5%	39	12	31%	5.69	Patrol, two platoons up, one follows
235	10	4%	34	11	32%	6.91	Two up, one back, patrol base ops
219	20	9%	40	4	10%	5.48	Patrol, Co in column, bump technique
133	11	8%	14	6	43%	9.50	Dismounted platoon patrol base ops
223	15	7%	22	9	41%	10.14	Co high speed insert, platoon patrol base ops
224	44	20%	32	30	94%	7.00	Co high speed insert, co patrol base ops
1458	142	10%	224	87	39%	6.51	

Table VII-13 - Battalion Combined Arms Level - SCLA Feb 2001							
BLUFOR			OPFOR				
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
369	83	22%	47	43	91%	7.85	Penetration, patrol, diamond formation
377	82	22%	75	53	71%	5.03	Penetration, patrol, parallel formation
363	118	33%	97	88	91%	3.74	Penetration, helo/surface, patrol base ops
326	73	22%	70	52	74%	4.66	Thrust, one company holds, one attacks
1435	356	25%	289	236	82%	4.97	

Table VII-14 - Combined ProMet Experiment Casualty Data							
BLUFOR			OPFOR				
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
507	86	17%	123	51	41%	4.12	Platoon level, Ft Ord
611	129	21%	147	63	43%	4.16	Platoon level, SCLA
1458	142	10%	224	87	39%	6.51	Company level, SCLA
1435	356	25%	289	236	82%	4.97	Battalion level, SCLA
4011	713	18%	783	437	56%	5.12	

Table VII-15 - <i>Urban Warrior</i> Limited Objective Experiment (LOE) 1								
	BLUFOR			OPFOR				
Event	Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
1	65	46	71%	40	23	58%	1.63	Penetration/seize bldg 5
2	66	14	21%	37	19	51%	1.78	Penetration/seize bldg 5
3	64	28	44%	38	25	66%	1.68	Penetration/seize bldg 5
4	164	52	32%	31	19	61%	5.29	Thrust
5	143	62	43%	37	8	22%	3.86	Thrust
Totals	502	202	40%	183	94	51%	2.74	

Table VII-16 - <i>Urban Warrior</i> Limited Objective Experiment (LOE) 2								
	BLUFOR			OPFOR				
Event	Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks
1	104	75	72%	101	91	90%	1.03	Penetration/seize bldg 5
2	83	33	40%	90	78	87%	0.92	Penetration/seize bldg 5
3	96	41	43%	89	59	66%	1.08	Penetration/seize bldg 17
4	60	56	93%	93	50	54%	0.65	Penetration/seize bldg 17
5	69	20	29%	27	21	78%	2.56	Penetration/seize bldg 5
6	206	91	44%	95	74	78%	2.17	Thrust
7	199	63	32%	81	52	64%	2.46	Thrust
Totals	817	379	46%	576	425	74%	1.42	

Table VII-17 - <i>Urban Warrior</i> Limited Objective Experiment (LOE) 3								
BLUFOR			OPFOR					
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks	
161	47	29%	32	14	44%	5.03	Penetration	
161	47	29%	32	14	44%	5.03		

Table VII-18 - <i>Urban Warrior</i> Advanced Warfighting Experiment (AWE) - Oakland, CA								
BLUFOR			OPFOR					
Total in box	Total casualties	Percent casualties	Total in box	Total casualties	Percent casualties	Force ratio	Remarks	
53	33	62%	62	18	29%	0.85	Penetration	
45	27	60%	61	22	36%	0.74	Penetration	
40	24	60%	46	5	11%	0.87	Penetration	
38	2	5%	30	2	7%	1.27	Penetration	
95	19	20%	62	27	44%	1.53	Penetration	
162	59	36%	97	27	28%	1.67	Building clear	
286	151	53%	83	40	48%	3.45	Building clear	
91	29	32%	81	49	60%	1.12	Building clear	
810	344	42%	522	190	36%	1.55		

ProMet Total Vehicle Casualty Information.

Table VII-19 Platoon Level Events (14 events) at Ft Ord and SCLA				
Total In Box	Total Mob Kill	Total Cat Kill	Total Casualties	Percent Casualties
26	3	0	3	12%
2	0	0	0	0%
22	2	3	5	23%
16	1	1	2	13%
7	0	1	1	14%
21	1	0	1	5%

Table VII-20 Company Level Events (7 Events) at SCLA					
Vehicles	Total in Box	Total Mob Kill	Total Cat Kill	Total Casualties	Percent Casualties
M1A1	24	1	0	1	4%
M88	1	0	0	0	0%
LAV	25	0	4	4	16%
AAV	40	1	3	4	10%
HMMWV	50	10	0	10	20%
GATOR	27	0	2	2	7%
LVS	1	0	0	0	0%
5-Ton truck	1	0	0	0	0%

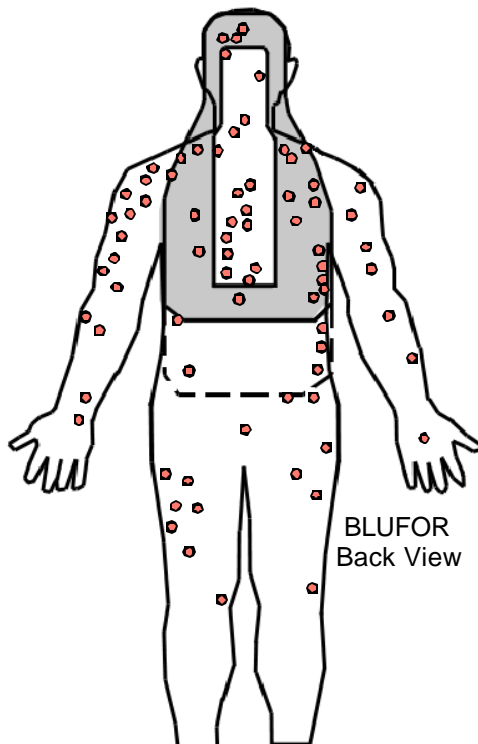
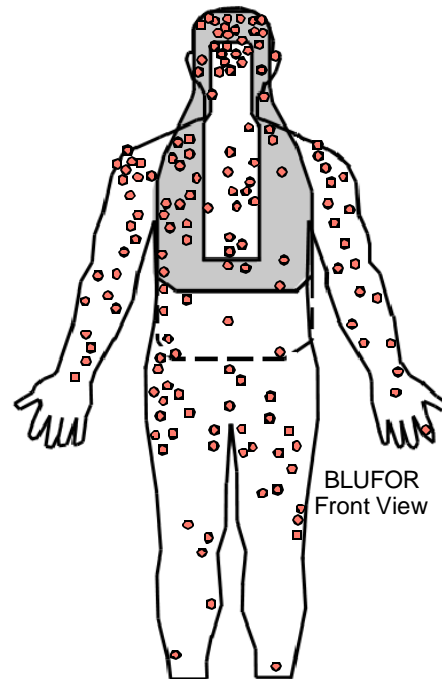
Table VII-21 Battalion Level Events (4 events) at SCLA					
Vehicles	Total In Box	Total Mob Kill	Total Cat Kill	Total Casualties	Percent Casualties
M1A1	16	3	0	3	19%
M88	1	0	0	0	0%
LAV	12	1	4	5	42%
AAV	39	1	7	8	21%
HMMWV	46	0	8	8	17%
GATOR	22	0	1	1	5%

Table VII-22 Combined Totals for ALL Events (25 events)					
Vehicles	Total In Box	Total Mob Kill	Total Cat Kill	Total Casualties	Percent Casualties
M1A1	66	7	0	7	11%
M88	4	0	0	0	0%
LAV	59	3	11	14	24%
AAV	95	3	11	14	15%
HMMWV	103	10	9	19	18%
GATOR	70	1	3	4	6%
LVS	1	0	0	0	0%
5-Ton truck	1	0	0	0	0%

Location of Simunition Hits on Experiment Participants

BLUFOR. The following charts show the location of simunition hits. This information is consistent with findings in previous experiments because we see that the preponderance of wounds are located in the head, right upper torso, or weapon. This is because Marines, who are mostly right handed, expose their right side at a greater rate when popping corners or aiming at the enemy over or around cover to engage the enemy. Of the 251 recorded hits, 69% were frontal and 31% were in the rear.

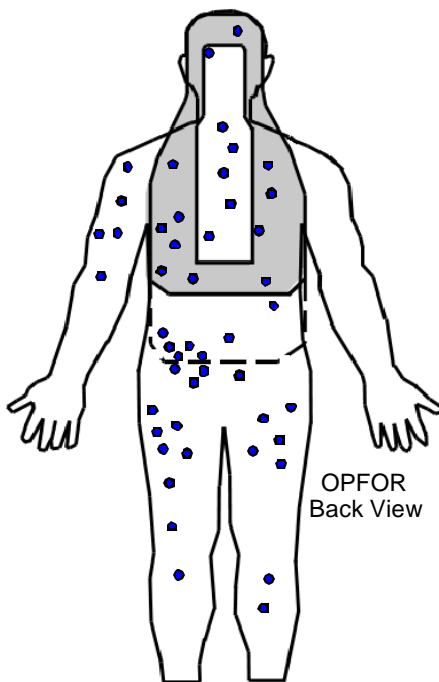
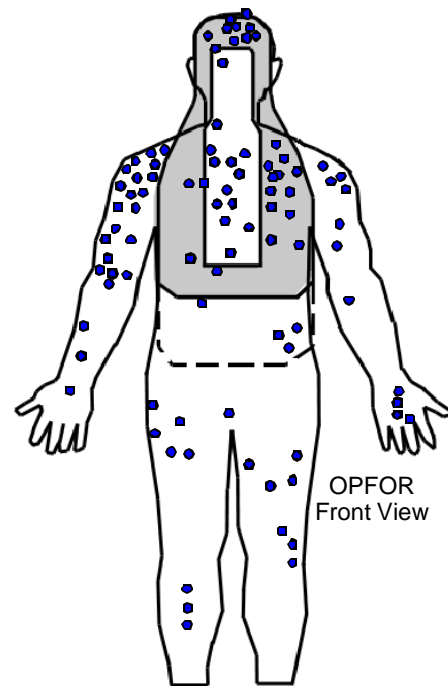
BLUFOR Front		
Hit Location	No. Hits	% Total
Head	41	24%
Torso	59	34%
Right Arm	22	13%
Left Arm	19	11%
Right Leg	17	10%
Left Leg	16	9%
Total	174	



BLUFOR Rear		
Hit Location	No. Hits	% Total
Head	8	10%
Torso	37	48%
Right Arm	7	9%
Left Arm	14	18%
Right Leg	4	5%
Left Leg	7	9%
Total	77	

OPFOR. OPFOR hit information is quite similar. Of the 140 recorded hits, 66% were frontal and 34 % were in the rear, and the body locations were similar.

OPFOR Front		
Hit Location	No. Hits	% Total
Head	11	12%
Torso	33	35%
Right Arm	23	25%
Left Arm	11	12%
Right Leg	8	9%
Left Leg	7	8%
Total	93	



OPFOR Rear		
Hit Location	No. Hits	% Total
Head	2	4%
Torso	25	53%
Right Arm	0	0%
Left Arm	5	11%
Right Leg	7	15%
Left Leg	8	17%
Total	47	



Section VIII Daily Experiment Summaries

5 February 2001

Experiment Objectives:

- ? To evaluate a battalion formation for movement through an urban area.
- ? To define how the battalion commander would be able to maintain command and control capabilities.
- ? To define how the battalion would insert and extract Scout Snipers.

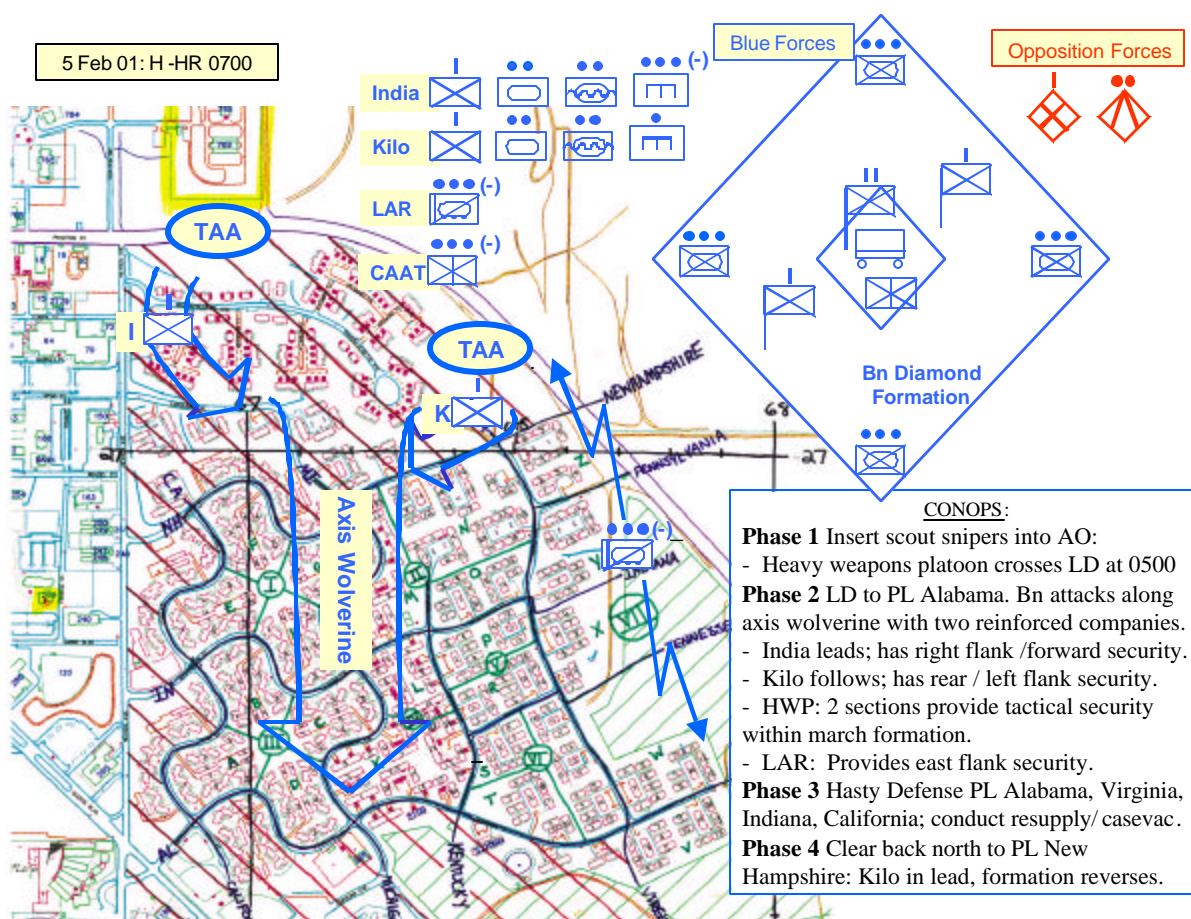
As illustrated on the *Operational Overlay*, the concept of experimental operations was to insert Scout Snipers early in the morning before sunrise to provide overwatch positions along the battalion's axis of advance.

- Battalion combined arms team penetrates the city moving north to south along Axis Wolverine in a diamond formation with Alabama Road as a limit of advance.
- Light Armored Reconnaissance platoon screens to the eastern side of the city providing spot reports if/when enemy is observed.
 - Emplace overwatch positions along the battalion's axis of advance prior to its movement.
 - Insert teams at night prior to the day's experiment.
 - Use a diamond formation (as depicted on the graphical operations overlay) of two reinforced companies, a combat service support detachment, a foot mobile, tactical operations center (TOC), and a quick reaction force comprised of CAAT elements.
 - The TOC and CSS detachment would be at the center of the formation.
 - TOC composed of Battalion CO, S-3, Air Officer, Sergeant Major, and other Marines fulfilling security responsibilities. The Main COC was to remain outside of Desolate City and assist the TAC in situation awareness.

Experiment Results:

- The diamond formation never really materialized.
 - However, distribution of assets seemed to work well.
 - Elements of the lead company in the battalion formation pushed south faster than the other elements, breaking the integrity of the diamond formation, and thus gapping the spherical security of the diamond formation.
- Five four-man scout/sniper teams were able to insert undetected into the battlespace.
- Scout/sniper teams were able to effectively use the ISR, although sometimes they had to move just a few feet to establish solid comm.
- Scout/snipers reported directly to the nearest company in their area vice reporting to the battalion combat operations center, facilitating movement, bypassing a link in the chain.
 - This made information flow faster—getting it down to the user quickly.
 - It appears that the normal flow of observation to the battalion COC and then down to the companies is too slow for the urban environment.
 - The negative aspect of reporting directly to the companies is that it makes tracking of the enemy difficult for the battalion COC.
- Foot mobile TOC allowed the leadership to have face-to-face interaction with the company commanders, providing much better situational awareness.
- TOC did not have someone directly responsible for security and navigation.
 - This causes some problems.
 - In future experiments, the Sergeant Major will have those responsibilities.
- There was a deficiency observed in CAS procedures.

- Battalion leadership felt that this was due to the fact that forward observers (FOs) were acting as forward air controllers (FACs) and they had limited training time on 6-line procedures for rotary wing CAS.
- Intra Squad Radio (ISR) was not effective for talking to pilots due to its limited range.
- Battalion felt a deficiency in number of SINGARS available because squad leaders were not able to talk with platoon commanders.
- They suggest additional SINGARS for squad leaders to facilitate that information flow.
- Liaison between the company gunnery sergeants and combat service support liaison was not very effective.
 - The CST liaisons are new to the battalion, as pointed out by the leadership, and should improve over time and familiarity with SOPs of the unit.
- CAAT assets alone as a quick reaction force was only marginally effective.
 - Battalion leadership feels that a mix of LAVs and CAAT vehicles would provide a more flexible, heavier punch.



6 February 01

Experiment Objectives:

- ? Evaluate patrol formations and options for platoon-sized elements.
- ? Examine the effectiveness of the CSS liaison system at the company level.
- ? Evaluate the six-line brief for RW CAS missions.
- ? Determine whether pushing a trauma team to the company level extends the “Golden Hour.”

The day’s experiment was designed to have these three phases.

- Phase I. LAR platoon (+) pushes south along eastern side of Desolate City, screening the movement of the battalion.
- Phase II. Battalion moves into city from east to west and establishes company patrol bases.
- Phase III. Companies conduct patrolling operations in their assigned sector.

Experiment Force Organization:

- Some CAAT and LAV assets organized into a quick reaction force (QRF).
- Other CAAT elements patrol western half of City in conjunction with scout/sniper teams.
- Combat Engineers spread loaded throughout battalion
 - Responsible for tank security during movement.
 - Reduces overall Engineer platoon capability but provides rapid (“up front”) obstacle clearance options thereby enhancing mobility.

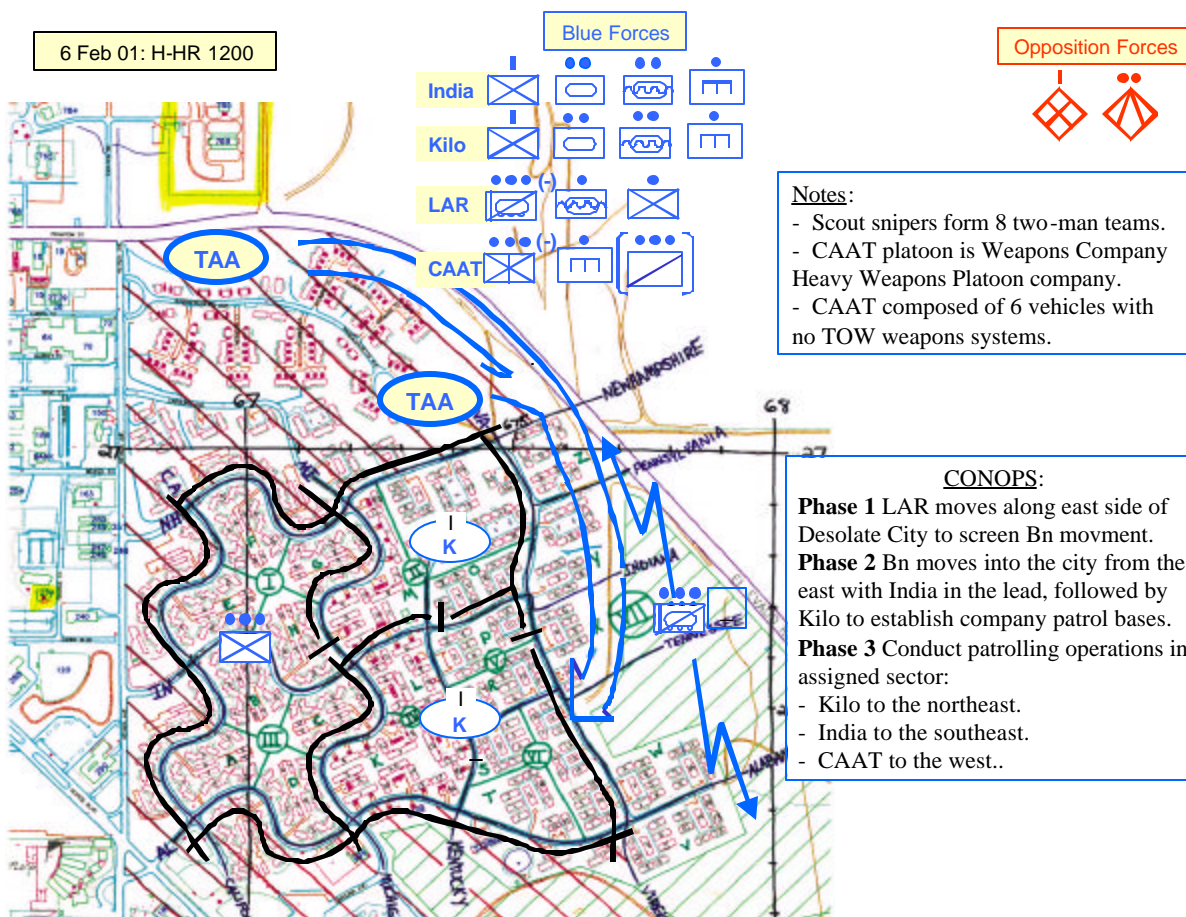
“Swarm” Tactic:

- Establish company and platoon patrol bases as strong points.
- Send out reinforced patrols to drive the enemy into these strong points.
 - Goal is to saturate area with flexible yet potent patrols to dislodge the enemy, causing them to move and run into strong points where he could be defeated.
- Swarm tactic is used because there are not enough Marines to seize and clear building after building in a large urban environment.
- Concept based on premise that only two squads at a time would be able to patrol in a prolonged operation.
- Rotation of patrolling also takes into account time for vehicle crews to rest.
- Enhanced medical team (“Trauma Team”) located at company patrol bases.
 - Concept is to have surgeon or enhanced medical treatment personnel at company casualty collection points in order to extend the golden hour via more thorough triage techniques.
- Evacuation of wounded to BAS is coordinated by company gunny and CST liaison.

Experiment Results:

- Battalion had difficulty in transitioning from movement to patrolling operations.
 - Patrols from the respective companies were sent out too soon.
- Need battalion “Go Firm” to establish situation awareness up/down chain before patrols.
- Company that used specific rally or objective points for the movement into the patrol bases experienced improved command and control.
- Since the entire battalion was not moving and patrolling operations were being conducted, there were no real advantages to having a TOC forward.
- Main COC tracked progress of patrols and enemy contact and fed information to the TOC.
- UAVs are able to observe the terrain, but cannot see people near the buildings who are tucking up against them.

- Need capability to record what UAV sees during flights.
 - 10 mph (and above) wind caused great difficulty in flying the UAV.
- When IR camera is used, the smaller field of view was less effective than the daytime panoramic feed.
- Leadership feels that the UAV should be a battalion asset as it is too much for the companies.
- Battalion COC found it a struggle to push employment of air down to the companies because of communication problems.
 - Once control of air was pushed down to the companies, the six-line request was quicker than the normal nine-line.
- Helicopters could not be safely/effectively employed as observation or sniper platform.
- Use of Marine solely dedicated to duty as an “information manager” worked effectively.
 - His responsibilities were to listen to the radio and maintain friendly unit locations on a map for quick reference of the commander.
 - This technique worked well, freeing the commander to concentrate on leading his Marines instead of being tied to the radio tracking friendly movements.
- Refueling was facilitated by the work of the CST liaison at the company level.
 - Four AAVs refueled in 45 minutes using fuel cells loaded in the back of a HMMWV.
- Trauma teams experienced enhanced situation awareness when traveling in Gators compared to their experience while traveling in the back of an AAV.
- The doctors felt that the presence of the trauma teams at the company level could lengthen the “Golden Hour” but it was hard to quantify based on simulated casualties.
- Combat engineers moving with CAAT vehicles increased the mobility of the western forces.
- Engineers felt they could increase the mobility of the battalion with their own CAAT type HMMWVs (w/light armor and 240G Machine Guns mounted in the turret) vice .50cal or Mk 19s in high-back HMMWVs—which are too vulnerable for urban combined arms operations.



7 February 01

Experiment Objectives:

- ? Evaluate air assault into an urban environment.
- ? Evaluate the transition from daytime operations to nighttime operations.

The experiment was planned to have four phases.

1. Phase I.
 - 1.1. Insertion of scout/sniper teams into the vicinity of the LZ for the helicopterborne assault.
2. Phase II.
 - 2.1. LAR platoon (+) tasked to perform a feint to the eastern side of Desolate City, allowing one infantry company to simultaneously insert by helicopter into the southwestern sector of the city.
3. Phase III.
 - 3.1. Other company (+) crossed the LD until link up with the helicopterborne assault force.
4. Phase IV.
 - 4.1. Defense of the sector until extract.

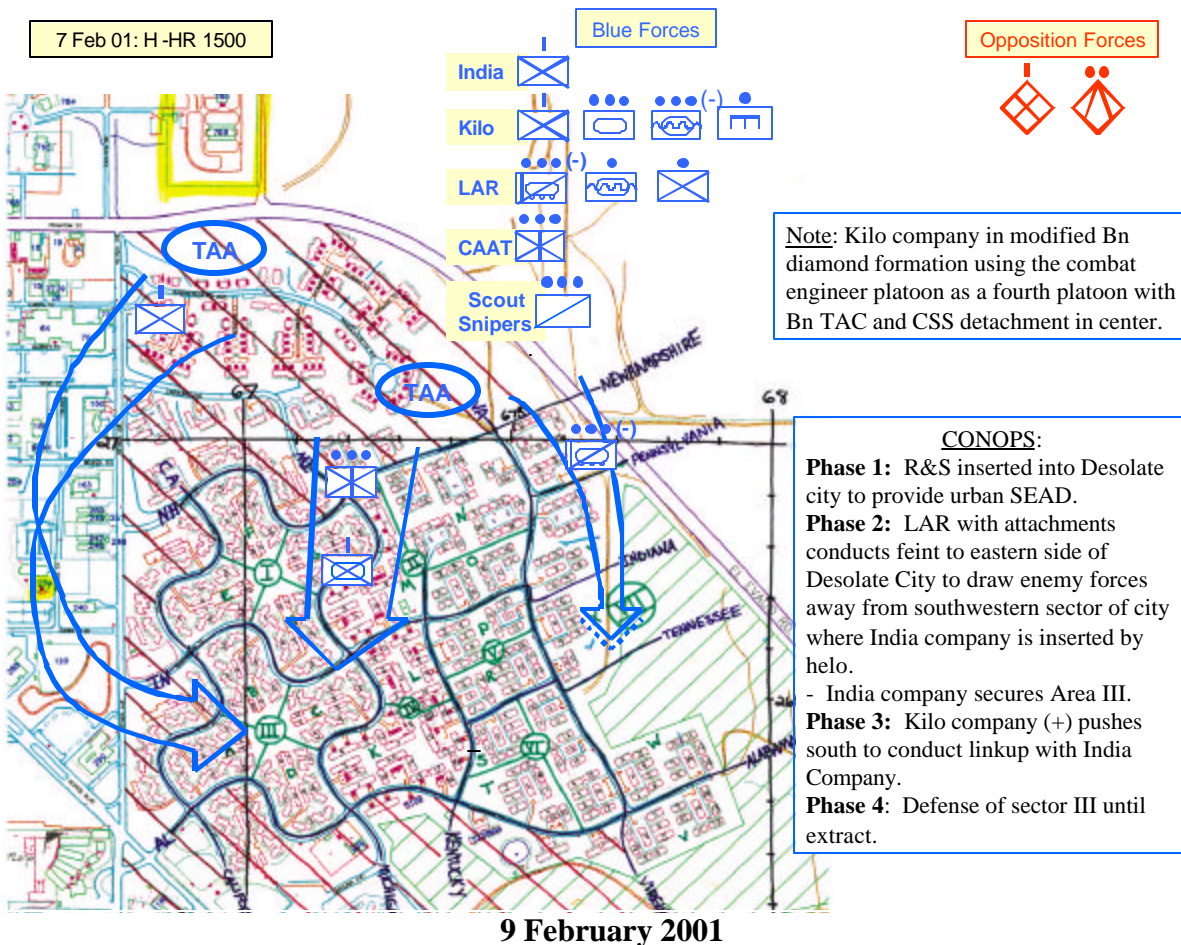
Experiment Results:

- Helicopterborne assault (actual) cancelled because of bad en route weather between Camp Pendleton and SCLA.
 - Helicopterborne assault *simulated* into the LZ in the southwestern sector of the city.
- Foot mobile insert provided an increased force protection capability to the simulated helicopterborne force.
- Having a scout sniper representative in the Main COC is very beneficial to the staff.
- The combined arms force that pushed down from the north was too complex for the company commander to control effectively.
 - The company had four elements/platoons to maneuver plus the CST.
 - They used a diamond formation for their movement.
 - Having just one axis for the movement was detrimental to the tanks and AAVs.
 - Multiple axes needed to increase the survivability of the mechanized assets.
- If mechanized assets are static for too long they become casualties.
- CSS element rolled up under the company during the movement.
 - Their movement inside the formation was either too fast or slow.
 - The forth platoon at the rear of the diamond was forced into tracking the CSS elements in the middle vice coordinating movement with the platoons on the flanks.
 - Decentralized CSS structure is needed to facilitate tactical movement.
- Transition from daylight to nighttime operations was again difficult.
- Fratricide is a big concern for conducting nighttime operations.
- Coordination of routes and movements has to be pushed up and down the chain.
- A firm base should be established—preferably before dark—prior to sending out patrols.

The extract took place the following day.

- Tracking position updates from the companies was difficult.
- The companies were very linear in their movement out of the city.
- First company pushed out with little contact but their movement alerted the enemy to the other company's movement from their defensive position to the east.
- The last company became very strung out along their axis.
 - Their focus was to the east rather than on maintaining a spherical awareness.

- Failure to maintain a spherical awareness proved to be costly in that the last company took the majority of the casualties for the day during this movement.



Experiment Objectives:

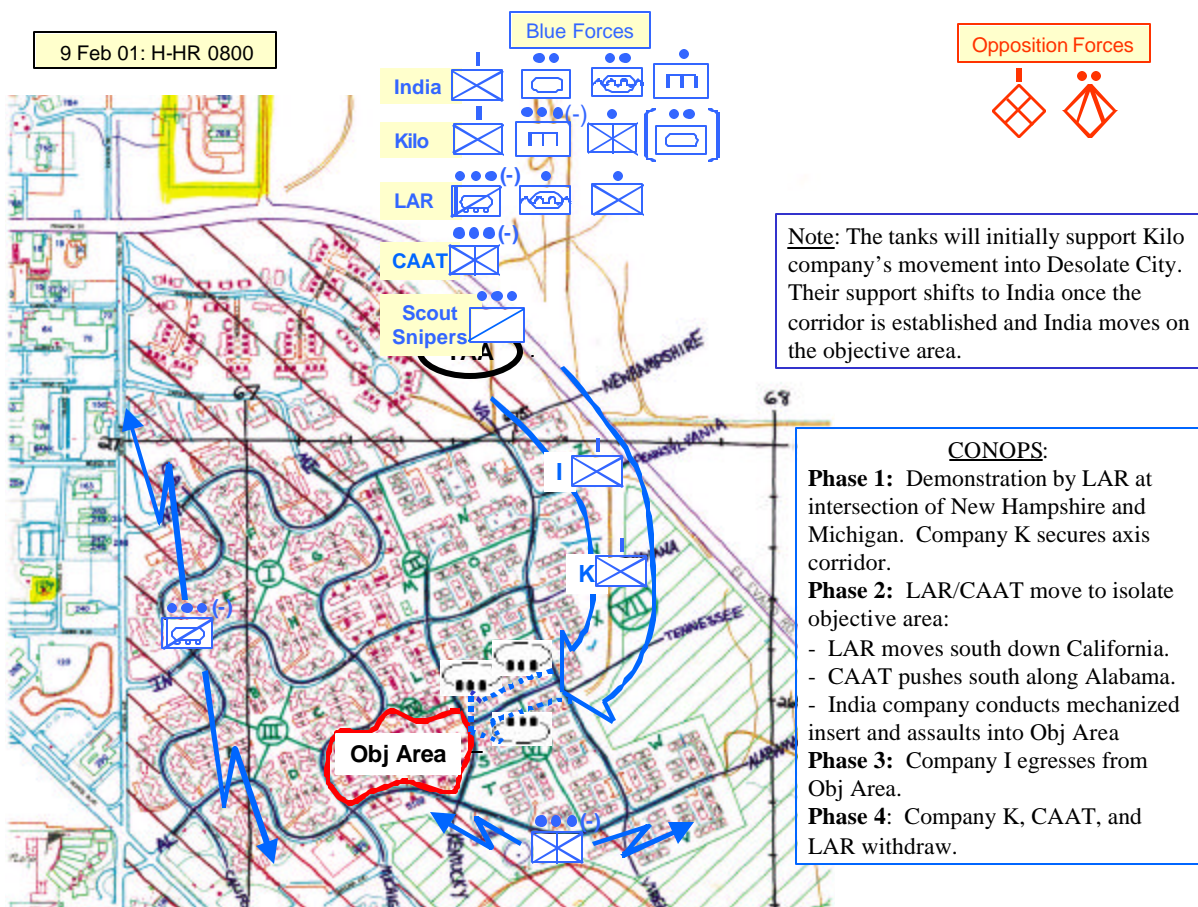
- ? Evaluate the effectiveness of the *Thrust* concept.
 - Use speed and shock followed by a planned withdrawal.
 - Create a security corridor to facilitate rapid advance of follow-on forces to a particular objective.
 - Hold open the corridor throughout actions on the objective to facilitate resupply, casualty evacuation and/or reinforcements.
 - Withdraw the raid force through the corridor—after the actions on the objective are complete—under the security provided by the force holding it open.
 - Collapse the corridor in stages allowing for the security force to withdraw.

Test the thrust concept in four phases.

- Phase I. One company secures the axis positions while LAR conducts a demonstration to the north of Desolate City to confuse the enemy.
- Phase II, the second company isolates and clears the objective area.
 - Upon completion of the demonstration to the north, the LAR platoon covers the western edge of the city to pick off enemy forces if they withdraw from the objective area.
 - Hand off operational control of the tanks from the securing force to the raid force as the raid force approaches the objective area.
- Phase III. The raid force egresses from the objective area.
- Phase IV. The security force egresses from the corridor.

Experiment Results:

- The thrust axis was effective—employing both speed and shock against the OPFOR.
- Company tasked with securing the axis positions was front-loaded with tanks and engineers.
 - Engineers made a fourth platoon for the company, and having the majority of the combat engineer Marines together facilitated the conduct of breaching operations along the axis.
- Battalion surgeon stated that having the corridor open facilitated resupply and CASEVAC.
- The UAV did a good job of identifying obstacles prior to forces crossing the LD.
- However, it should have a north-seeking arrow on the display for better SA.
- Positioning the main COC in the AAV-C7 was effective in helping maintain SA.
- There was a lag time in RW CAS.
 - Battalion leadership felt that the company commanders were hesitant to clear fires into their AOR because of the problem with tracking friendly forces.
 - Staff asserted that there could be real value added by having a Marine whose sole responsibility is to maintain tracking of the location of friendly units.
- Battalion effectively used single channel/plain text to communicate with the aircraft.
- Squad and team leaders reported discomfort with not being able to maintain visual contact (see) all their Marines when their unit was on the move.
- Battalion felt a guide/traffic director is beneficial to orient dismounting troops from AAVs.
- The infantry are blind in the back of AAVs during a high-speed movement.
 - A camera on the outside of the AAV with a display and intercom in the troop compartment would help build situation awareness for Marines inside.



Section IX Rotary Wing Operations

Objectives. (All in the context of low-rise urban terrain.)

- Assess ways to mitigate the effect of low-rise urban terrain on the ability of aircrews to locate friendly and OPFOR positions.
- Examine effectiveness of current tactics against live simulations of man portable air defense systems (MANPADS) and a radar-guided gun / surface to air weapon (SAW).
- Evaluate ability of aircrews to identify targets while maintaining tactical integrity.
- Evaluate use of 6-line CAS brief as an alternative to existing 9-line CAS brief.
- Explore CAS command and control alternatives.
- Assess air-ground communications available for small unit CAS.
- Evaluate survivability of assault support helicopter lifts.

Findings.

Position and Target Identification

1. Successful when friendly forces marked their positions with colored smoke.
2. *Only* effective when friendlies responded to the aircraft's call for the mark.
3. When friendly forces deployed smoke *before* it was called for, the smoke often dissipated or spread over OPFOR positions before aircraft arrived.
 - a. In a few instances, the OPFOR mimicked the friendly colored smoke within minutes of BLUFOR forces deploying it. This drives a requirement for aircrew to distinguish between BLUFOR and OPFOR marks.
4. BLUFOR routinely overcame smoke mimicking with careful timing and coordination of smoke deployment. However, this is only possible when clear two-way communication is available. (See C² findings below.)
5. Because there will be several colors of smoke on the battlefield, inform the aircrews that the mark has been deployed, but leave it to the pilots to confirm the color of the mark. This will help to prevent them from mistaking the mark.
6. Because of the environment, we were unable to mark the enemy positions with tracer fire, 40mm smoke or 40mm illumination rounds.
7. We did not experiment with other marking devices.

Effectiveness of Current Tactics.

1. Our videotapes showed us that obstructed and restricted fields-of-fire were limiting factors for successful engagements when aircrew used proper tactics.
 - a. See spreadsheet on *MANPAD Results* and *SAW Results* below.
2. Urban terrain provides both manpads and SAWs increased ability to hide in the urban sprawl. However, this often limits their sight lines and fields of fire.
3. Pop up, shallow diving fire in close proximity to the intended target proved highly survivable.
 - a. With exposure times of 3-12 seconds, this reduced the aircraft's susceptibility to OPFOR SAWs and manpads.
4. The pop and dive profile was found to be the most effective way to successfully visually break out and engage ground level targets. It was significantly superior to a flat, level delivery option because it increased the ability of the CAS aircrew to acquire and engage enemy positions.
5. SAWs were not affected as much as the MANPADS.

Target Identification

1. A major limiting factor in urban CAS is being *sure* of the location of friendly forces. We saw this as a greater challenge in MOUT than in the non-urban environment because of the close-quarters, noncontiguous nature of the urban battlespace. Our experiments always presented *danger close* CAS missions against an OPFOR that was usually within 100 meters of the FLOT.
2. During “troops in the open” or anti-personnel CAS missions, aircrews identified OPFOR by their black uniforms. However, aircrew had to be at close range to do so. Thus, aircrew could not always begin shooting on the “cleared hot” call because they had to make the positive ID.
3. When OPFOR was out in the open, aircrew successfully engaged those targets (with the above noted restriction), but when they were inside buildings, positive ID was not possible without a target mark or a FAC with the ability to clearly and concisely talk the pilot’s “eyes-on” the target.
4. Aircraft in our experiments did not employ on-board defensive systems, so their primary defense against threat systems was terrain masking.
5. Terrain masking / low altitude flight clearly reduced the number of successful engagements by OPFOR MANPADs and SAWs.
6. Aircrew using terrain masking / minimum altitude flight had significant difficulty in acquiring targets due to the vertical relief of low-rise buildings.
7. Aircrews consistently identified *and* engaged the target when they used pop-up maneuvers and shallow diving fire in close proximity to the intended target.
8. Videotapes showed that aircrews using the above tactics consistently experienced fewer valid “shots” against them and much lower exposure times.
 - a. See summary spreadsheets at the end of this section.

Use of the 6-line CAS Brief

1. RW CAS was very responsive once both GCE and ACE became comfortable with use of the 6-line briefing form.
 - a. Although none of the FACs in the battalion had ever worked with the 6-Line brief, air control personnel found the form easy to use with only a minimum amount of time required to learn it.
2. Commonly referred to as “click and point” CAS because it does not require a map or a protractor, the 6-line brief merely requires the terminal controller to mark both his position and the target.
3. The simplicity of the 6-Line format was demonstrated when a Lance Corporal who was not TACP trained, executed two missions under the FAC’s supervision in a matter of minutes. No assistance was required.
4. Users found it effective for immediate fire support (no TOT).
5. CAS requested by the 6-line is understood to be immediate, unless otherwise directed by the terminal controller.

Effective Ways to C² the ACE Support to the Battalion

1. During the chaotic, compressed engagements typical of our experiments, we saw that unit leaders *at all levels* had to know how to effectively request and control short-response-time, *danger close* CAS.
2. The battalion CO gave each company the authority to clear fires and control aviation assets down to the platoon level. This procedure significantly reduced the time to clear fires into an area.

3. The company used the same procedure to request CAS that they use to request indirect fires except that the company commander was the final clearance-to-fire authority.
4. Due to the non-availability of FACs—or knowledgeable substitutes—with heavily engaged squads, we saw some situations where it took nearly 30 minutes to get CAS even though aircraft were in holding/on-station.
5. We found that because the company commander is fully involved in leading his company in the fight, the company XO, as the Fire Support Team leader, is a functional and effective alternative to exercise the cleared-to-fire authority.
 - a. Next to the commander, he is person most aware of the scheme of maneuver and the best way to use any necessary fire support.
6. In our experiments, the battalion air officer was located with the battalion command element while the (only) FAC acted as the air officer at the company level.
 - a. This dictated that Marines controlling aircraft were platoon commanders and artillery forward observers.
7. Only the units that were familiar with aviation procedures were able to effectively use the RW CAS assets.
8. Units that conducted classes and training had increased the ability of NCOs to control RW CAS aircraft in the close fight (less than 1000 meters).

Appropriate Radios For Ground-To-Air Communication With Ace Assets.

1. At the direct line-of-sight distance of one kilometer or less, the Intra Squad Radio (ISR) can receive transmissions from the aircraft, but does not have the output power to effectively transmit to key the aircraft radios.
2. To overcome the lack of radios at the platoon level, we used a VHF single-channel, plain text frequency on the PRC-113s.
 - a. This enabled successful communications at the company level where more radios were available.
 - b. However, when Marines used the only radio in the platoon to control CAS assets—in support of a platoon or squad—there was no other way to communicate with the company.
 - c. To compensate for this, the company assigned its artillery FOs (and radios) down to the platoon level.
 - d. Although this arrangement was workable for the experiment, it points to the fact that squad leaders need access to a VHF/UHF radio—preferably a hand held model—to control CAS and other ACE support.
3. A possible solution is the PRC-112 aircrew survival radio. This programmable UHF radio has an output strong enough to key aircraft radios giving it the potential to work in the CAS environment.
 - a. We intend to conduct experiments to determine the effectiveness of the PRC-112 during CAS missions.

Company Sized Helicopter Insertion/Extraction Into/Out Of Multiple Landing Zones.

1. We had to cancel the company insertion because of bad weather in the mountain passes between Camp Pendleton and Victorville.
2. We experimented with force extraction. The aircraft landed in the LZs, but due to the close proximity of the surrounding obstacles, they were forced to use a slow, highly canalized, deliberate approach—well below 30kts.
3. This made the assault aircraft extremely vulnerable because of their reduced airspeed and maneuverability as they neared touchdown.

4. We do not have enough information to make any universal judgments. However, it is probably safe to assume that the approach described above will be typical in much of the urban battlespace; i.e., that we are forced to select marginal LZs because they are the only ones available. This reinforces the need for effective urban SEAD.

Debrief and Reconstruction Comments. The following is a compilation of the aviation specific debriefs and discussion points from experiment participants. This includes ProMet staff, and members of 3rd Battalion, 4th Marine Regiment.

5 Feb Debrief.

1. More 6-Line training and practical application needed for BUST.
2. Deconfliction of air assets can be tough, but it cannot be the determining factor.
3. FACs need to be proficient in the 6-Line prior to conducting experimentation.
4. There is a real need for the SINGARS radio or equivalent at the squad level.
5. When flying against threat systems, aircrews need to tell the GCE when they get threat warning indications on their equipment so that the GCE can try to neutralize those threats.
6. Smoky SAMS are necessary when operating a MANPADS threat system against aircraft so the aircrew know that they are under fire.
7. The ISR does not have the power output to key the radios onboard the aircraft.
8. The PRC-112 aircrew UHF programmable survival radio could fill the role of controlling aircraft during Urban CAS. It is designed for use with aircraft.

6 Feb Reconstruction

1. India Company used R/W CAS assets for cover/recce with a known threat in the area.
 - a. This is a bad idea because it tipped the location of the friendly forces' penetration point into the urban sprawl.
2. Pilot communications to FAC about ADA indications needs to happen so the GCE can try to suppress the threat.
3. Single-channel VHF/UHF is necessary for CAS to be controlled at the platoon level.

6 Feb Debrief

1. Aircraft should not be used during the initial stages in a movement to contact.
 - a. Wait until there is contact and use aviation assets as the needed punch.
2. When aircraft are in the target area, enemy hunkers down and stays out of sight.
 - a. This negates the potential for using a/c to pinpoint enemy location(s).
3. To improve/minimize response time, aircraft must push into the target area when the words "fire mission" are passed.
4. The aircrew can copy the remainder of the 6-Line while en route to the target area.
5. The GCE needs to be able to respond appropriately when aircraft are inbound for a mission in order to facilitate coordinated ACE and GCE maneuver.
 - a. This response may be movement or direct fire suppression on the enemy.

7 Feb Brain Trust

1. Based on past experiences, the first wave of a vertical assault is doable, but after that, problems will arise. Predictability is the inverse curve of momentum.
2. Urban SEAD—get someone on the ground first by using small clandestine teams to search out enemy ADA assets. We will examine this in future experiments.
3. Clandestine teams need to be utilized along ingress and egress routes to LZs.
4. There will be a requirement for several small teams to sanitize the area.
5. Deception is a good idea for assault operations into the city.

6. We cannot become comfortable in choosing the zones because in a true urban conflict the zones will be what are available vice what is desired.
7. The enemy will target the suspected and limited LZs that are available within an urban environment.
 - a. They may do this by indirect fire (i.e. mortars), direct fire, or by simply mining the LZ if the surface permits.
 - b. They may even line the outskirts to create a kill zone to trap Marines once they exit the aircraft.
8. Direct, real-time communication between aircraft and the UAV operator would enable us to optimize use of ACE assets. The GCE must be in this loop also.
 - a. This information flow may require the development of new ways of passing information.
9. UAVs could become a valuable asset IOT deny the enemy rooftop positions.
10. Fire support when approaching an LZ is usually conducted from the inside out, meaning that assault support aircraft engage targets closest to the LZ and then progress outward.
 - a. The concept of working from the outside in is a valid one if small teams are inserted to observe the area to control fires and prosecute targets from outside the LZ and work inward.
11. UH-1Ns are a good alternative to insert small teams to observe the target area.
 - a. They are capable of inserting into more areas while maintaining fast-rope and rooftop landing capability.
12. The helicopter extract will always be extremely difficult because the enemy knows you are there. The element of surprise is gone and the reality that the same LZs will no longer be useful is a valid one, reference the Russian-Chechen conflict of '94-'96. This drives the enemy to conclude that we will use an LZ for extract that supports our maneuver and intended target area. Anticipate that we will move to the closer zones vice maneuvering through the whole city (with our wounded) to other zones. This action reduces momentum while increasing predictability. Our forces can expect a high concentration of enemy forces will mass near LZs closer to the target area, especially on extract because the element of surprise is nonexistent.

9 Feb Debrief.

1. Utilizing the chain of command to clear fire missions was successful.
 - a. During one mission, the FO sent up a 6-line, but awaited the company commander's approval before running the mission.
 - b. The company commander cancelled the mission because friendlies were located in the target building.
2. Consideration of adjacent companies within the target area requires company commanders to clear fires between companies, not just platoons within their own company.
3. This requirement for clearance of fires between companies will force Company FSTs to keep strong tabs on platoon positions within the urban setting and pass that information through Battalion TAC.
4. To overcome hesitance by the battalion in clearing fires, assignment of sorties to the company / platoon level may be the most advantageous way to use RW assets as it allows aircraft to rapidly provide close air support.
5. Aviation fires should be cleared in the same way as indirect fires.
6. The company XO as the FST leader should clear fires at the company level and the FSCC should clear fires at the battalion level.

7. The company commander may not be the best one to clear fires at the company level. His job is to fight the company and he becomes so task saturated that clearing fires only adds to that burden.
8. The company XO, as the FST leader, should perhaps shoulder this responsibility.
9. A time-on-target (TOT) is not used when working with the 6-line brief except for coordinated fire or maneuver.
 - a. When needed, put the TOT in the remarks section of the 6-line brief.
10. After the 6-Line is given, it is the pilot's responsibility to call for the friendly position mark (i.e. "Kingpin, mark your position"). This will prevent the mark from dissipating before the aircrew has a visual on the friendly position.
11. We should use white smoke only be as a last resort to mark a friendly mark. This is because targets often burn the same white color and the preponderance of screening smoke being employed is white smoke.
12. Communications brevity needs to get better. Bottom line is unless you are sending a fire mission, stay off the TAD net. This is especially true in cases where only one TAD net is used and there are aircraft supporting two different units on the same frequency.
13. In one instance, a 6-line was sent in advance of approval. This clogged the net, while a mission from the adjacent company that was ready to be executed was forced to wait because the net was clogged.
14. Employing snipers on a Huey is a *bad idea* because they are very vulnerable in this regime. This confirms lessons already learned in Somalia on Bloody Sunday.
15. The dialogue between aircrews and FACs needs to improve in regards to threat indications received onboard the aircraft.
 - a. The FAC has to know that the a/c have threat warnings that can alter delivery tactics.
 - b. And, the FAC needs to look for ways to adjust for aircraft survivability because a/c cannot support Marines on the deck if they cannot survive in the air.
16. The MAGTF needs to focus CAS on the overall mission, not on little firefights that may only slightly influence a mission. If there is enemy firing on a unit and it does not affect the outcome of the mission, then press through the conflict and proceed with the mission.

9 Feb Reconstruction

1. Lag time/responsiveness is still a problem. Assuming that there is a valid CAS mission available, the amount of time that elapses from when aircraft check on station to the time they execute their first mission is too long. This points to training, especially at the squad/platoon level so they know how to request and work with aviation assets. Additionally, Situation Awareness of friendly troop position/FLOT within the urban structures is a requirement for the Company FST. They must have a running situation awareness tab, but not hinder the "move, shoot and communicate" priorities of platoon commanders with Marines in the attack.
2. Missions were more successful as the week went on as aircrews and controllers became more familiar with the 6-Line format and squadrons were flying more realistic profiles for weapons delivery.

Urban Aviation (RW) Recommendations.

1. Conduct further experiments to determine the most effective system to use for identifying friendly positions.
2. Create an urban CAST trainer for use by individual units to increase the capability of Marines to control CAS assets in the urban environment.
3. Use CAST Fire Support exercises to enable Marines to visualize how urban CAS would flow and allow an opportunity for feedback on the conduct of the mission.

4. Utilize terrain models for small unit FST exercises. Smaller scale terrain models allow Marines to apply the information presented in class and are a good practical application tool. This training enables Marines to apply what they have learned about the 6-Line during the planning/execution of missions. This training is effective in providing a good base for Marines to build upon before working with actual aircraft in the field.
5. Continue training on the 6-Line Brief to develop an understanding of its potential to enable aircrews to provide immediate fire support for the GCE.
6. Continue to review the role of the FSCC in urban environments to determine if procedures should be instituted to clear fires at the company level.
7. Develop procedures for requesting/clearing fires at the company level with the company XO, as the FST leader, responsible for clearing all company fires.
8. Create urban training scenarios that require tailoring of flight profiles to account for the urban terrain and reinforce tactical demands of threat exposure and/or target acquisition difficulties.
9. Develop standard visual reference systems, which can assist aircrew in identifying targets/zone locations visually. These reference systems should be the *same* systems used by the GCE. The level of detail for aircrew need not be as detailed as that of the GCE.
 - a. For example, do not try to assign a building number to every building in a zone of action, thereby producing information clutter. This slows down the visual identification process for the aircrew and is impractical in developing nations where structures may be temporary in nature.
10. We need to continue to explore ways to adapt the MACCS to the unique aspects of the urban battlespace.
11. Train personnel at platoon and squad level to understand how to control rotary wing CAS using a 6-Line briefing format.
12. In the fragmented, decentralized urban battlespace, the FAC may not be able to get to every unit that needs CAS. Therefore, the responsibility for emergency control of CAS can be with the platoon commander and squad leader.

Limitations to Aviation Experiments During ProMet.

1. ***Lack of Nighttime Operations.*** There were no nighttime operations flown in support of this experiment. Because this experiment was ProMet's initial step with aviation operations and due to the limited number of sorties available, daytime operations were the focus of this experiment. Additionally, this is the time when aircraft will have the highest vulnerability because many of the technological advantages we possess in the night environment are not applicable during daylight hours.
 - a. Assumptions about the applicability of our experiments to nighttime operations are not valid.
2. ***No Chaff/Flare Deployment.*** Aircraft were not permitted to deploy chaff or flare during the experiment. So we focused on exposure time of the aircraft to the system, not whether the system was able to successfully engage that aircraft.
3. ***Restriction of Airspace at SCLA.*** Due to airspace use restrictions and the need to deconflict with runway traffic, the threat systems had less difficulty finding aircraft because search area was reduced.
4. ***Inability to Use Multiple Options to Mark Friendly Positions and Enemy Targets.*** Because the exercise was force-on-force, position and target marking was limited to use of colored smoke and "talk-on" by FACs. This made acquiring the target more difficult for the aircrew throughout the experiment.

5. **Clearing of Landing Zones.** As a matter of safety and usability, debris and obstacles were removed from the landing zones to enable aircraft to safely utilize the zones for training. This told the OPFOR where to look. In a true urban environment, landing zones will be based on what is available, especially during inserts into forward areas.
6. **Lack of Mobility of Threat Systems.** Each day the threats were placed in a position that would be advantageous for their employment as well as supporting the OPFOR scheme of maneuver. Due to restrictions around the training, and the level of experience of aircrews in working in this environment, the threats were kept in one spot throughout the day. This also gave us a better indication of effective versus ineffective tactics because each target run was viewed from the same location.

Other Experiment Factors. Unlike many *aviation only* experiments, this experiment had significant forces on both sides. This enabled us to examine the ability of aircrews to effectively differentiate between friendly and enemy forces in the urban sprawl.

1. **Friendly/Target Location.** The enemy was outfitted in different uniforms and used small units in a hit-and-run, decentralized fashion. These tactics, when coupled with the environment, made it more difficult for aircrews to locate and engage enemy targets.
2. **Size and Location of the Battlespace.** The former George AFB housing area consists of 300 buildings with over 1,000 individual units in a battlespace of approximately one square kilometer. This challenged the aircrew that have worked these problems in MOUT sites that have only about 30 buildings and aircrew can often see the entire area from one position.
 - a. Consisting of one- and two-story buildings, George is similar to the urban environments in many third world countries such as Somalia.
 - b. Navigation proved difficult because the buildings are situated close together and there are only three different floor plans so all of the structures look the same.
 - c. The housing area is a series of cul-de-sacs and winding streets. Streets are neither oriented in the typical north-south, east-west manner nor are they straight for any significant distance.

Explanation of Data Collection Terms Used on Spreadsheets.

1. **Event.** Events were numbered in sequential order from the beginning to the end. And, they are numbered according to what was in the field of view of the threat weapon system during the engagement. Most often, this only consisted of one aircraft, but there were instances when aircraft were flying in loose formation so that the system was able to observe two aircraft at once.
2. **Type of Aircraft.** Each event was separated by aircraft type. In the event of a mixed flight such as UH/AH, each aircraft was broken out and given an individual event number so as not to skew the data one way or another.
3. **Shot.** We used the videotapes to determine whether a shot had been taken at the aircraft.
 - a. For the SAW, a shot was recorded when the operator had lock and “fire” appeared on the display.
 - b. For the MANPADS, a shot was recorded when lock-on was achieved and the display read “successful engagement.”
 - c. This does not mean that every shot taken was a hit.
 - d. “Successful engagement” means the system had a lock and a simulated missile firing.
4. **Radar/Optical.** These terms were specific to the SAW. Each engagement was acquired by either radar or optical means.
 - a. These results were captured by using radar when the system achieved positive lock or optical when the operator used this mode to visually acquire the target.

5. **Obstructed View.** Through review of videotapes, which gave us the view from both systems, we determined whether or not the system had clear line of sight to the target when a shot was fired. When the systems engaged targets through trees, wires, or buildings, we determined the shot to be obstructed. One restriction placed upon each threat system was their inability to move positions. The manpad was tied to its power source and the SAW was placed in position by EXCON based upon the mission and OPFOR location.
6. **Exposure Time.** This is defined as the amount of time in seconds that the aircraft were: 1) in range of the specific system; and, 2) in view of the MANPADS or the radar for the SAW. These are the only way the systems could engage these targets.
 - a. When the aircraft was visible but heavily obscured by trees or buildings, the exposure time was not calculated.
 - b. Because of the low number of CH-46E and CH-53E sorties, their exposure time was factored together under the “Assault” header.
 - c. Exposure time continued to be calculated even after the aircraft was engaged by the given threat system to account for the fact that more than one system could be employed at any time.
7. **Profile.** The profile was split into these six groups to specify the aircraft flight regime when it was exposed to each of the threat systems.
 - a. Takeoff. The time from when the aircraft lifted off the ground until the point where translational lift was lost and the aircraft transitioned to forward flight.
 - b. Holding. When a pattern was established at a point away from the target area, but still inside the maximum effective range of the two threat systems.
 - c. Ingress (Time). From the time that the aircraft left the holding position inbound to the landing zone/target area until the point when assault aircraft landed or CAS aircraft began their transition to the pop (see next term, below).
 - d. Pop. The point where the aircraft begins climbing to reduce airspeed and visually locate the friendly/enemy positions. The pop was complete when the aircraft pulled off the target after having “fired” simulated ordnance.
 - i. Applicable to both UH-1N and AH-1W.
 - e. Egress (Time). From the point when the aircraft pulled off target (for CAS), or the point when they transitioned to forward flight and turned away from the LZ/target area (for assault lift)—until they were established back in holding—or—were out of the max range of the threat system.
 - f. Landing. When aircraft began transition from forward flight until they were on the deck.
8. **Range.** The range was only calculated for the SAW because the manpad system did not have range-finding capability. During each run, the range was calculated at the point where the SAW was able to get radar lock on the target. For those instances when lock-on was not achieved, the range was calculated at the point where the aircraft was closest to the threat system.

Table IX-1 Results of the SAW / Gun System																				
Type A/C					Shot		Guidance Mode		Ob-structed View		Exposure Time By A/C Type			Profile						Range
Event	Ch-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	T/O	Holding	Ingress	Pop	Egress	Landing	Meters
1				X	X		X			X			14				X	X		670
2a				X	X		X			X			31				X	X		420
2b				X	X		X			X			12				X	X		700
3				X	X		X			X			7					X		1000
4			X		X		X	X		X		50				X	X	X		950
5			X		X			X		X		58				X	X	X		470
6			X		X		X	X		X		7						X		600
7			X		X		X			X		18						X		800
8			X		X		X			X		20						X		860
9			X		X		X			X		9					X			500
10			X		X		X			X		27					X	X		1160
11			X		X		X			X		32				X	X	X		410
12			X		X		X			X		25				X	X	X		710
13			X		X			X		X		7				X				1060
14			X		X			X	X			15				X				1180
15				X		X	X		X				0							1500
16				X		X	X		X				2							1600
17				X		X	X		X				3							1730
18				X		X	X		X				2							1460
19				X		X	X		X				0							1380
20				X		X	X		X				1							1780
21				X	X		X		X				4					X		1790
22				X	X		X		X				4					X		1020
23				X	X		X			X			22			X	X	X		1190
24				X		X			X				7			X	X			1260
25				X		X		X	X				12			X	X			760
26			X		X		X			X		29				X	X	X		780
27			X		X		X			X		24				X	X	X		510
28			X		X			X	X			10						X		1010
29			X		X			X		X		17						X		700
30			X		X		X			X		22						X		860
31			X		X		X			X		19						X		570
32			X		X		X		X			34			X					1130
33	X					X				X	15					X				1100

Table IX-1 Results of the SAW / Gun System																					
Type A/C					Shot		Guidance Mode		Ob-structed View		Exposure Time By A/C Type			Profile						Range	
Event	Ch-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	T/O	Holding	Ingress	Pop	Egress	Landing	Meters	
34				X	X		X			X			6			X					1150
35		X		X		X			X		45				X						2800
36		X		X		X			X		24				X						3000
37		X		X					X		65				X						3100
38	X				X		X			X	48					X				X	800
39	X				X		X			X	9									X	1300
40	X					X	X			X	14				X						1100
41				X	X		X			X			14							X	2380
42				X	X		X			X			11			X					2430
43				X	X		X			X			8			X					1800
44				X	X		X			X			10					X			1820
45				X	X		X			X			13				X	X			1400
46				X	X		X			X			14					X			850
47				X		X	X			X			17					X			1290
48				X	X			X		X			12			X	X				1300
49				X	X		X			X			20			X	X	X			2000
50				X	X		X			X			32			X	X	X			1700
51				X	X		X			X			16					X			1150
52				X		X	X			X			8		X						1310
53				X	X		X		X				8				X				1260
54				X	X		X			X			9					X			1300
55				X	X		X			X			17		X						1320
56				X	X		X			X			20		X						1260
57	X				X		X			X	18				X						590
58		X			X		X			X	10				X						2800
59				X	X		X			X			4				X				1300
60				X	X		X		X				6				X				1340
61				X	X		X		X				6				X				2100
62				X	X		X		X				8				X				930
63				X	X		X			X			21				X	X			1500
64		X			X		X			X	10								X		1280
65				X	X		X		X				5			X	X				1830
66			X		X		X			X		21				X	X	X			1830
67				X	X		X		X				12				X	X			860
68				X	X		X		X				19			X	X	X			1340

Table IX-1 Results of the SAW / Gun System																					
Type A/C					Shot		Guidance Mode		Ob-structed View		Exposure Time By A/C Type			Profile						Range	
Event	Ch-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	T/O	Holding	Ingress	Pop	Egress	Landing	Meters	
69				X	X		X			X			7					X		760	
70				X	X		X			X			18			X	X	X		1700	
71				X	X		X		X				2				X			1300	
72				X	X		X		X				6					X		1460	
73				X	X		X		X				2					X		1510	
74				X	X		X		X				22			X	X	X		870	
75				X	X		X			X			31			X	X	X		850	
76			X		X		X			X		21				X	X	X		900	
77				X	X		X			X			35			X	X	X		1370	
78			X		X		X			X		20				X	X	X		1370	
79				X	X		X		X				12			X	X			1630	
80				X	X		X			X			20			X	X	X		1520	
81			X		X		X			X		13					X	X		1410	
82				X	X		X			X			9				X			1860	
83				X	X		X			X			35				X	X		1650	
84				X	X		X			X			35				X	X		1240	
85				X	X		X			X			17					X		1250	
86			X		X		X			X		35				X	X	X		1120	
	5	5	23	57	72	14	78	8	28	58	258	533	688	0	10	32	42	48	4		
					Average exposure time							25.8	23.2	12.7	Average distance						1313m

Table IX-2 Results of the MANPADS Engagements																			
Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type			Profile					
Event	Ch-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	Take Off	Holding	Ingress	Pop	Egress	Landing
1				X	X				X				7				X		
2				X	X				X				4			X			
3				X	X				X				8					X	
4				X		X			X				10					X	
5			X		X				X			8				X			
6			X		X				X			11				X			
7			X			X			X			13				X			
8			X		X					X		15						X	
9			X		X					X		25						X	
10			X		X					X		45				X	X	X	
11			X			X			X			11				X			
12				X	X				X				14			X			
13			X		X				X			30				X	X	X	
14			X		X					X		14				X			
15			X		X				X			22						X	
16			X		X				X			11						X	
17				X		X			X				3					X	
18				X	X				X				3			X			
19				X	X					X			18			X			
20				X		X				X			8			X			
21			X		X					X		12				X			
22			X			X				X		7						X	
23			X		X				X			27				X			
24			X		X				X			10				X			
25			X		X					X		11						X	
26			X		X					X		11				X			
27			X		X				X			12						X	
28			X		X				X			25					X		
29			X		X				X			23						X	
30			X		X				X			12			X				
31				X	X				X				7				X		
32				X	X				X				3				X		
33				X	X				X				6				X		
34				X		X			X				0						
35				X		X			X				0						

Table IX-2 Results of the MANPADS Engagements																			
Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type			Profile					
Event	Ch-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	Take Off	Holding	Ingress	Pop	Egress	Landing
36	X				X				X		30					X			
37	X					X			X		0								
38	X				X					X	25					X			
39	X				X					X	15					X			
40	X				X					X	12					X			
41	X				X					X	15					X			
42		X			X					X	40								X
43				X	X					X			30				X	X	
44				X	X					X			25			X			
45			X		X					X		23				X			
46				X	X				X				14			X			
47				X	X				X				8			X		X	
48			X			X			X			6						X	
49				X		X			X				19			X			
50				X	X					X			14			X		X	
51				X	X				X				5					X	
52				X	X				X				0					X	
53				X		X			X				11			X		X	
54				X	X					X			8					X	
55			X		X					X		15						X	
56				X	X				X				8					X	
57				X	X				X				8					X	
58				X	X				X				6					X	
59				X	X				X				7			X		X	
60				X	X					X			17					X	
61				X	X					X			20			X			
62				X	X				X				8			X		X	
63			X		X					X		35			X				
			6	1	25	31	51	12	39	24	137	434	299	0	2	31	8	28	1
					Average exposure time						19.6	17.7	9.6						



Section X Universal Needs Statement (UNS) Summaries

UNIVERSAL NEED STATEMENT (UNS) Vehicle-Infantry Communications

Part 1a of 5 - Originator's Request

Originator

Name (Last, First, Initial) Bush, Tyler, N.	Rank/Grade Captain	Phone 703-784-3785	FAX 703-784-4921
Available for phone or personal follow-up? <input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT? <input type="checkbox"/>	Request UNS status updates by e-mail? <input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input type="checkbox"/>	IMPROVE or FIX an existing capability	<input checked="" type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need

Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. Squad leaders need to effectively communicate with armor and mechanized assets on the battlefield from a covered position. Right now there is no reliable way for dismounted squad leaders to communicate effectively with tank and armored vehicle crewmembers while operating in close proximity with them in the urban battlespace using the ISR. The compressed, noncontiguous nature of the urban battlespace almost always makes it exceptionally dangerous for a Marine to get in front of vehicles to give the necessary hand and arm signals.
2. This need was identified by the Marine Corps Warfighting Lab (Project Metropolis) during force-on-force experiments with I MEF Operating Forces over the past two years.
3. A dismounted Marine must expose himself enemy fire to operate the Tank-Infantry Phone—effectively eliminating this as an option to satisfy this need.
4. The currently fielded ISR can be modified by running a piece of wire from the ISR to the vehicle 1780 communications box to allow vehicle crewmember's effective communication through their crew helmets. This modification can be even further enhanced by adapting an external antenna with magnet for easy mounting and dismounting.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)	<input type="text"/>
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Rationale

Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

Until this need is met, the tactical potential of small units in the Operating Forces—principally Rifle Squads—is significantly reduced when fighting as a combined arms team during MOUT.

Describe mission or task to be accomplished that is related to the need.

Control movement and direct fire weapons of armor and mechanized forces.

How does the need improve your ability to perform the mission or task?

Satisfying this need will allow squad leaders to talk directly to vehicle crews/commanders when maneuvering and/or providing direct fire support—without having to unnecessarily expose themselves to hostile fire.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

If the need is not satisfied, the ability of squad leaders in combined arms teams to control direct fire weapons platforms in any environment is greatly restricted, reducing the ability to develop decisive action and maintain maneuver tempo. This could set the conditions for mission failure—or—excessive, unnecessary casualties.

UNIVERSAL NEED STATEMENT (UNS) Platoon Commander to Squad Leader Comm

Part 1a of 5 - Originator's Request - Originator

Name (Last, First, Initial) Bush, Tyler, N.		Rank/Grade Captain		Phone 703-784-3785		FAX 703-784-4921	
Available for phone or personal follow-up?	<input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT?	<input type="checkbox"/>	Request UNS status updates by e-mail?	<input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil	RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input checked="" type="checkbox"/>	IMPROVE or FIX an existing capability	<input type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need

Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

An infantry platoon commander engaged in combat has no way to communicate tactically with his squad leaders other than by hand and arms signals or messenger. There is no radio link between him and the squad leader. This means that he cannot optimize the tactical maneuver of his platoon in the urban battlespace where short response-time decisions have to be carefully coordinated to generate decisive results and reduce the potential for fratricide. This need was identified by the Marine Corps Warfighting Lab (Project Metropolis) during force-on-force experiments with I MEF Operating Forces over the past two years.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)
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Rationale

Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

Until this need is met, the tactical potential of small units in the Operating Forces—principally infantry platoons—is significantly reduced when fighting in the urban battlespace. Experimentation and field operations show us that platoon commanders are using the ISR to bridge the gap in communications between themselves and the squad leaders, passing critical mission information on an unsecure net. The enemy is intercepting and using this information. The ISR was not procured for squad to platoon commander communications, and it is not a suitable radio for this purpose.

Describe mission or task to be accomplished that is related to the need.

Command and control within the infantry platoon.

How does the need improve your ability to perform the mission or task?

1. Satisfying this need will provide a secure capability for platoon commanders to communicate with squad leaders to coordinate squad movements and issue orders. This will increase situation awareness and aid in command and control. It can also enable decisive operations and reduce the potential for fratricide.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

1. If the need is not satisfied, the ability of squad leaders in combined arms teams to control direct fire weapons platforms in any environment will be greatly restricted thereby reducing our combat effectiveness. It will also increase the time required to process orders, fire support, increase the potential for fratricide and induce the passing of critical information over the unsecured ISR. This could set the conditions for mission failure.

UNIVERSAL NEED STATEMENT (UNS) Man-Portable Marking Device

Part 1a of 5 - Originator's Request - Originator

Name (Last, First, Initial) Bush, Tyler, N.		Rank/Grade Captain		Phone 703-784-3785		FAX 703-784-4921	
Available for phone or personal follow-up?	<input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT?	<input type="checkbox"/>	Request UNS status updates by e-mail?	<input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil	RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input checked="" type="checkbox"/>	IMPROVE or FIX an existing capability	<input type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need

Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. The Marine Corps needs a man-portable device that can be used to mark positions in the urban battlespace.
2. This need was identified by the Marine Corps Warfighting Lab (Project Metropolis) during force-on-force experiments with I MEF Operating Forces over the past two years. Over the course of the experiments, Marines used dyed rope, engineer tape, and chemically activated luminescent sticks to mark key locations. This is because they lacked a universal way to apply the NATO coloring system to mark results of combat actions.
In the NATO coloring system, Red means building is not clear, green means building clear, yellow identifies the casualty collection point (CCP), and blue is used by engineers to mark booby traps and mine fields.
4. The color code system is an effective one, but we are critically deficient in the availability of devices that we can use to apply these colored marks.
5. This need is critical because use of appropriate colors is abandoned during battle as soon as ways to mark key terrain are unavailable. This shortfall will almost certainly lead to fratricide in a close quarters urban battle.
6. A dependable, man-portable marking device will eliminate this deficiency and significantly mitigate risk to warfighters in the urban battlespace.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)	<input type="text"/>
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Rationale

Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

Until this need is met, the potential for unnecessary casualties and fratricide at the small units level is significantly increased. Additionally, casualty collection action is severely hampered during MOUT.

Describe mission or task to be accomplished that is related to the need.

Effectively mark positions with a device that all Marines can easily operate to apply the NATO color system.

How does the need improve your ability to perform the mission or task?

Satisfying this need will allow squad leaders to increase situation awareness and communication among units. Accurately marking these positions in a timely and universally understood method would reduce casualties inflicted by both enemy and friendly forces as awareness of other units would be enhanced.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

Marines will continue to seek work-around ways to apply a color marking system to generate situation awareness, avoid unnecessary casualties and reduce the potential for fratricide. For example, the fratricide during the platoon level experiment of Project Metropolis was 14%. Of this 4%, most (44%) casualties were caused by friendly hand grenades used in room clearing. Effective marking would have changed this.

UNIVERSAL NEED STATEMENT (UNS) Knee and Elbow Pads

Part 1a of 5 - Originator's Request

Originator

Name (Last, First, Initial) Bush, Tyler, N.		Rank/Grade Captain		Phone 703-784-3785		FAX 703-784-4921	
Available for phone or personal follow-up?	<input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT?	<input type="checkbox"/>	Request UNS status updates by e-mail?	<input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil	RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input checked="" type="checkbox"/>	IMPROVE or FIX an existing capability	<input type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need

Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. The Marine Corps needs hard-shell knee and elbow pads to protect warfighters from unnecessary injuries in the urban battlespace because of the abundance of concrete, glass and jagged rubble.
2. This need was identified by the Marine Corps Warfighting Lab (Project Metropolis) during force-on-force experiments with I MEF Operating Forces over the past two years.
3. Without the knee and elbow pads, Marines incur deep cuts, abrasions, fractures and serious contusions from concrete decks, sharp edges and the like. This danger is present in training as well as actual operations.
4. In addition, the potential for casualties from enemy fire is increased because the constant threat of injury from the terrain causes Marines to hesitate to "hit the deck" quickly.
5. This also can significantly slow combat tempo thereby seriously degrading mission accomplishment.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)	<input type="text"/>
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Rationale

Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

1. Until this need is met, the potential for unnecessary casualties is significantly increased during MOUT.

Describe mission or task to be accomplished that is related to the need.

Individual movement in the urban environment.

How does the need improve your ability to perform the mission or task?

Satisfying this need will facilitate quicker urban maneuver and reduce battle and non-battle casualties.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

Marines will continue to incur unnecessary casualties thereby degrading forces available for mission accomplishment.

UNIVERSAL NEED STATEMENT (UNS) Mechanical Breaching / Forcible Entry Kit**Part 1a of 5 - Originator's Request****Originator**

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Available for phone or personal follow-up? <input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT? <input type="checkbox"/>	Request UNS status updates by e-mail? <input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil
			RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input type="checkbox"/>	IMPROVE or FIX an existing capability	<input checked="" type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. The Marine Corps rifle squad can greatly increase its combat effectiveness in the urban battlespace by acquiring lightweight, easy to use mechanical breaching (forcible entry) kit.
2. Experiments conducted by the Marine Corps Warfighting Laboratory (Project Metropolis) clearly demonstrated that a compact, easy-to-carry kit containing a sledge hammer, Hooligan Tool, fire axe and crow bar/flat bar significantly aided infantry squads force their way into/through uncleared buildings during MOUT.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)	<input type="checkbox"/>
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Rationale Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

1. Until this need is met, Marines are significantly slowed while fighting their way into and through enemy held or barricaded buildings during MOUT. This can cause loss of mission effectiveness or even bar mission accomplishment. The Marine enhancement program (MEP) has endorsed this forcible entry kit.

Describe mission or task to be accomplished that is related to the need.

Assaulting a defended building or barricaded facility in MOUT.

How does the need improve your ability to perform the mission or task?

Satisfying this need will decrease the time it takes to make entry into buildings. They also reduce the time Marines have to be in the open areas (streets, alleys, etc.) where most of the casualties occur. Thus, a forcible entry kit increases the rifle squad's mission effectiveness while decreasing its potential to incur casualties.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

If Marines continue to use the existing methods, squad mobility remains dependent upon boot heels (kicks), rifle butts, and direct fire for forcible entry. They will also fail to reduce their vulnerable time in the open as they break into buildings or overcome barricades in buildings. This can induce unnecessary casualties and jeopardize mission accomplishment.

UNIVERSAL NEED STATEMENT (UNS) Small, Maneuverable Resupply Vehicle

Part 1a of 5 - Originator's Request - Originator

Name (Last, First, Initial) Bush, Tyler, N.		Rank/Grade Captain		Phone 703-784-3785		FAX 703-784-4921	
Available for phone or personal follow-up?	<input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT?	<input type="checkbox"/>	Request UNS status updates by e-mail?	<input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil	RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input checked="" type="checkbox"/>	IMPROVE or FIX an existing capability	<input type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need

Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. The Marine Corps can greatly increase its combat effectiveness in the urban battlespace by acquiring a small, highly maneuverable resupply vehicle.
2. Experiments conducted by MCWL (Project Metropolis) clearly demonstrated that a small vehicle (the John Deere GATOR) was extremely successful and highly survivable in carrying resupply items to infantry squads, platoons and companies while engaged in high intensity, force-on-force combat (live simulations using MILES 2000 gear and Simunitions). It was also very effective as a casualty carrier during CASEVAC operations.
3. Because of its small size/low profile and maneuverability across the irregular urban terrain, it maintained a steady resupply stream and CASEVAC retrograde thereby enabling maneuver forces to maintain tactical tempo and accomplish the mission more effectively.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)
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Rationale

Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

1. Until this need is met, Marines are sacrificing tactical effectiveness in the area of close-quarters combat service support in MOUT.

Describe mission or task to be accomplished that is related to the need.

Conduct resupply and casualty evacuation in MOUT.

How does the need improve your ability to perform the mission or task?

Satisfying this need will apply a combat multiplier to infantry units engaged in MOUT by facilitating timely and effective resupply. It will also upgrade casualty evacuation capability by limiting the amount of time spent in the open areas and reducing the amount of manpower required to move casualties. A decreased time in resupply results in better equipped Marines more of the time. Reducing the amount of manpower needed to move casualties, results in more Marines focused on the fight. And, shortening the time for CASEVAC clearly improves the chances for a wounded Marine to survive.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

If Marines continue to use the existing methods, resupply and casualty evacuation efforts are limited to foot mobile transportation or require the use of larger, less maneuverable, more vulnerable vehicles. Thus, the combat resupply option is limited to how much an individual or team of Marines can carry and the time it takes them to travel the required distance. This clearly degrades mission accomplishment. And, we do not take advantage of the potential to shorten CASEVAC times and increase survivability for our Marines.

UNIVERSAL NEED STATEMENT (UNS) Improved Combat Helmet Suspension System **Part 1a of 5 - Originator's Request - Originator**

Name (Last, First, Initial) Bush, Tyler, N.		Rank/Grade Captain		Phone 703-784-3785		FAX 703-784-4921	
Available for phone or personal follow-up?	<input checked="" type="checkbox"/>	Interested in participation on Solution Course of Action IPT?	<input type="checkbox"/>	Request UNS status updates by e-mail?	<input checked="" type="checkbox"/>	E-mail busht@mcwl.quantico.usmc.mil	RUC 20410

Type of Need (select one that best describes the need)

ADD a new capability that does not exist	<input checked="" type="checkbox"/>	IMPROVE or FIX an existing capability	<input type="checkbox"/>	REMOVE an existing capability	<input type="checkbox"/>
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Description of Need Describe the nature of the need and the cause (if known). Explain how the need was identified (operational deployment, training exercise, experimentation, formal study, mission area analysis, observed operating deficiencies).

1. The Marine Corps needs an improved combat helmet suspension system. In addition to being uncomfortable, the current suspension system in the PASGT helmet does not sufficiently hold the helmet on the head during the intense physical movements that are required of every Marine during combat in the urban battlespace.
2. The current system holds the helmet far to loosely on the Marine's head. This fact is especially glaring in the urban and mountainous environments, but is evident in every combat environment and situation.
3. This need was initially identified during three separate Urban Vertical Mobility Limited Technical Assessments conducted in Reno, NV and Oakland, CA.
4. During these LTAs, the existing PASGT helmet clearly showed its inability to maintain a position that allowed the wearer to see/shoot properly during such techniques as urban rappelling, high/top story window entry, elevator shaft climbing and employment of urban high angle rescue systems.
5. Further, MCWL Project Metropolis experiments concluded that the existing PASGT helmet suspension system in unfit for urban operations for similar reasons.
6. Our urban training and experimentation with squad, platoon, company and battalion sized units over the past two years highlighted the deficiencies in the current helmet suspension system during the MOUT mission essential tasks of movement, breaching, and clearing. These MCWL assessments and experiments originate with concept-based hypotheses and are conducted in accordance with formal letters of instruction (LOIs) with Operating Forces and supported with documented data analysis and detailed after action reports.

When Needed

URGENT	<input type="checkbox"/>	6 Months	<input checked="" type="checkbox"/>	1 Year	<input type="checkbox"/>	2 Years	<input type="checkbox"/>	5 Years	<input type="checkbox"/>	10 Years	<input type="checkbox"/>	Other (date)
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Rationale Describe why the need requires resolution in timeframe selected (e.g., safety issues, Congressional mandate, etc.)

1. Until this need is met, Marines are subject to unnecessary hazards due to helmet-induced restrictions while operating in urban or mountainous environments in the near future.

Describe mission or task to be accomplished that is related to the need.

Individual protection and movement in urban and mountainous environments.

How does the need improve your ability to perform the mission or task?

Satisfying this need will enhance situation awareness by improving visibility. It will enhance marksmanship because an improved suspension system will hold the helmet securely and not impair shooter's field of view. It will also facilitate mobility because the helmet will not be as prone to catch on the ever-present outcroppings that exist in the irregular urban terrain.

If the need is not satisfied, how will it affect your ability to perform the mission or task?

If Marines continue to use the existing PASGT helmet suspension system, their helmet will continue to fall over the eyes during annual weapon re-qualification, field-firing training, and battle engagement. Further, Marines conducting urban and mountainous training/combat operations will be hindered by a helmet suspension system that does not hold the helmet in place during ascent/descent of steep terrain, building assault, doorways and obstacle breaching, window entry, and room clears. In sum, the Marine is less combat effective by continuing to use the existing PASGT helmet suspension system. This clearly degrades mission accomplishment.

Section XI Technology LTAs and Other ProMet Evaluations

Weapons. The addition of Simunitions has given us a better idea of where Marines are going to be hit by the opposing force. As evidenced in the earlier section of this report, most hits occur in the upper torso—head, right shoulder and arms. This finding should not be a surprise, as this is the part of the body that is most often exposed when they are popping corners or firing around and over cover. One other major data point discovered is that there are a significant number of rifles hit as well. In most cases we do not believe that these weapons will be functional and will need repair or replacement. Clearly, logistics planners need to account for this increased usage factor.

Uniform. The urban area presents a great personal threat from blast effects and burns. Explosions are magnified by the hard surfaces and additional fragments are added from glass, concrete, wood, etc. Fires are prevalent in the urban environment and individuals need an increased fire protection capability. Additional protection can be added by having the Marines wear gloves (leather or nomex flight gloves), balaclava for head protection, and sand and wind goggles with the ballistic lens for eye protection. Consideration to providing a nomex type uniform needs to be made. This type of uniform might provide some protection against the effects of *thermobaric* weapons as well.

Spectra Gloves. There is a valid requirement to provide increased protection to an individual's hands during urban operations, especially when conducting a forcible entry through a glass windowpane. ProMet experimented with gloves with leather outer and a spectra inner liner during both company and battalion BUST packages and experiments. The consensus of the users was that the gloves did not meet the manufactures advertised protection capability. While the gloves increased protection against small cuts, they did not provide adequate protection against glass puncture as advertised. Furthermore, the users commented that the double thickness made the glove bulky and they did not like the loss of dexterity.

- Our experiments showed us that using a nomex flight glove or standard issue leather glove with Kevlar sleeves for the forearms was much more acceptable to the users.
- We also saw a decreased number of training injuries during the forcible entry practical application.

Small Urban Vehicle (SUV). MCWL has been evaluating and using a surrogate SUV since the beginning of the *Urban Warrior* experiment series. ProMet continued to use the John Deere Gator as the surrogate SUV during platoon, company, and battalion combined arms experiments. The vehicle was used by both the CSSE and the GCE as a resupply, engineer support, and casualty evacuation vehicle.

The Gators have proven to be the most survivable vehicles on the ProMet battlefield. Their small size enables them to move in areas where larger military vehicles cannot go. Their low profile keeps them below window and wall level. They can dart from one covered position to another reducing engagement possibilities much like individuals.

They have adequate load carrying capability to carry pre-packaged resupply “in” and multiple casualties “out.” The infantry battalion S-4 wrote:

The Gator proved to be an extremely useful asset at the company level...A small vehicle capable of carrying several hundred pounds and injured personnel is needed in an urban environment...

The US Army has procured a variant of the Gator for use as a casualty evacuation vehicle for airborne forces.

Intra Squad Radio (ISR). Overall, most of the Marines found the ISR easy to operate and felt that the capability enhanced their mission. However, during parts of the experiment the ISR was used to pass traffic beyond the squad level. The traffic that was passed had a high intelligence value for the enemy. The battalion COC—and presumably anybody else—was able to track friendly units simply by monitoring channels on the ISR. If we could track our units with the ISR, so could the enemy if they happened to obtain an ISR and a map. This is a realistic possibility in an urban environment because of its compressed nature, high casualty rate and the difficulty of casualty evacuation. It would be relatively easy for the enemy to pull the radio off of an injured/dead key leader. These are some ways that can mitigate this potential vulnerability:

- Plan, develop and coordinate brevity code words at the squad level before the attack.
 - This will reduce transmission time.
 - Ensure that the brevity codes are distributed down to the fire team leader level.
- Reinforce the importance of collecting all maps, CEOIs, and communications gear from all casualties as soon as the current tactical situation allows.

Racal Headset. The vast majority of the Marines found the Racal headset to be extremely uncomfortable while wearing a helmet. The plastic headgear portion of the headset is too heavy and bends the ears back even after a limited duration of wear. They all liked the big PTT button, but ended up modifying the headset to suit their needs. Efforts have been initiated to offer the option of a helmet clip and a headband.

Technology Week. Personnel trained during the company level BUST package and company level experiment, were made available to assist other MCWL or MARCORSYSCOM projects. The following information is provided as general information as each one drafted a separate report that is not included here.

Tactical Medical Casualty Support (TacMedCS). The TacMedCS prototype system was deployed during a portion of the *ProMet* experiment in order to identify and track casualty locations where possible. TacMedCS deployment involves the distribution of readers to medical corpsman in the field. As corpsmen identify casualties, they scan the casualty ID Tags, and enter appropriate information about the casualty; i.e., triage category, treatment given, and possibly injury type and location. The casualty information, along with GPS coordinates, is transmitted via RF modem to the TacMedCS ViewPort unit, usually staged at a command location; e.g., with the CSST or COC.

Medical and command personnel view the casualty-related data—displayed as an overlay on a map of the operational area—and use this information to assist them in making decisions about evacuation needs and focusing tactical and logistical resources in appropriate areas. The situation awareness provided by the TacMedCS system allows medical and command personnel to make faster, better-informed decisions in order to achieve mission accomplishment with minimum resources, as efficiently and effectively as possible.

Fire Team Cognitive Skills Trainer (FTCST). FTCST is a MARCORSYSCOM training initiative using commercial-off-the-shelf (COTS) PC hardware and a modified COTS PC wargame. The intent is to create a training tool to improve Marines' intra-team communication, cognitive, and decision-making skills. Marines were very enthusiastic during the training on the

FTCST. The positive aspects of the system were the communication between members of the fire team, albeit voice across the room, and the reaffirmation of mutually supporting other members of the team. The system also gives fire teams the ability to go force-on-force with another fire team.

MILES 2000. During the battalion level experiment, the *MARCORSYSCOM MILES 2000* team supported the experiment increasing the number of AT4 simulators and adding—for the first time—.50 cal blank firing/MILES systems for the AAV Up Gunned Weapon Station and simulators for the Mk 153 SMAW. MILES 2000 is quickly developing and fielding simulators and sensor suites to include all ground weapons enabling more realistic engagements. One area that requires emphasis is developing a capability of equipping fixed wing and rotary wing aircraft so they can participate more realistically in the fight.

Shoot Through the Wall (STTW). Schwartz Electro-Optics, Inc. (SEO) instrumented two buildings with a STTW MILES 2000 compatible system that will register rounds fired from any MILES 2000 weapon simulator outside the building and will assess the casualties inside via a network of sensors and emitters. By measuring the strength of the signal on multiple exterior sensors, it translates the weapon type and hit location, and then emits a corresponding signal inside the room. The system worked well, however because the sensors were easily visible, Marines tended to remain clear of the building. This capability is needed in future MOUT facilities to simulate more realistic weapons effects and improve training value.

Project Lincolnia. This was a separate effort from *ProMet* conducted under the aegis of the Center for Emerging Threats and Opportunities (CETO). It entailed three days of operations at SCLA—just prior to ProMet experiments—evaluating the effectiveness of a diversified set of UAVs and UGVs to increase the situational awareness of the GCE in the urban area. They have submitted a separate report.

